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ROYAL BOTANIC GARDENS, KEW

LIII—A REVISION OF THE EUCRYPHIACEAE.

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I. Introduction and Acknowledgments.

The genus *Eucryphia*, founded in 1797 by Cavanilles, was for a long time referred by different botanists to various different families, until in 1839 Endlicher in his "Genera Plantarum" raised it to the rank of a distinct family, which I consider still the best course to adopt. The most recent treatment of the *Eucryphiaceae* is that by Ernst Gilg in Engler and Prantl, Natürl. Pflanzenfam. **21** (1925). As, however, since then much more material, both dried specimens and wood for anatomical investigation, which may throw new light on its systematic position, has accumulated, the writer has undertaken a new revision, both taxonomic and anatomical, the latter especially in connexion with the relationship of the family with others. A broad discussion on the taxonomic position, based on morphology and anatomy, is given in the Sections V to VII.

The literature and synonyms in this monograph have been checked by myself, and all specimens mentioned, if not stated otherwise, have been identified or verified by me.

I wish to express my great indebtedness to Sir Arthur W. Hill, Director of the Royal Botanic Gardens, Kew, for all the facilities granted to me during my work at Kew. My heartiest thanks are also due to Mr. A. D. Cotton, Keeper of the Kew Herbarium, for his permission to work at the Herbarium and for his kind assistance. To the Herbarium Staff my best thanks for their valuable help, especially to Mr. N. Y. Sandwith and Mr. H. K. Airy-Shaw for many kind suggestions and helpful advice. For permission to work at the Jodrell Laboratory and for assistance in the anatomical part of the work I am very much indebted to Dr. C. R. Metcalfe, Assistant Keeper of that Laboratory.

Further, my sincere thanks are due to the Directors and Keepers of all the Herbaria mentioned below, for kindly granting facilities to work at their Herbaria, sending specimens on loan or giving valuable information and material for anatomical purposes. The abbreviations used for the different institutions in this work are as follows :—

(B.) Botanisches Museum, Berlin-Dahlem. (B.A.) Museo, Universidad Nacional, La Plata, Buenos Aires. (Br.M.) Dept. of Botany, British Museum (Natural History), London. (C.) University

Herbarium, Cambridge. (I.F.I.) Imperial Forestry Institute, Oxford. (K.) Royal Botanic Gardens, Kew. (L.) Rijksherbarium, Leiden. (L.S.) Herbarium, Linnean Society, London. (M.) Botanisches Museum, Staatsherbar, München. (N.Y.) New York Botanical Garden, New York, U.S.A. (O.) Fielding Herbarium, Oxford. (P.) Muséum Nationale d'Histoire Naturelle, Paris. (Sd.) Technological Museum, Sydney, N.S.W., Australia. (St.) National Natural History Museum, Dept. Botany, Stockholm. (U.) Botanisch Museum en Herbarium, Rijksuniversiteit, Utrecht. (W.) Naturhistorisches Museum, Wien. (Wh.) Smithsonian Institution, United States National Herbarium, Washington, U.S.A. (Yale) Yale University, School of Forestry, Newhaven, Connecticut, U.S.A.

II. Description of the Genus.

Eucryphia *Cavanilles*, Icones, **4,** 49 (1797) ; St.-Hilaire, Expos. **2,** 24 (1805) ; Persoon, Synops. Plant. **2,** 92 (1807) (sphalm. *Eucriphia*) ; Sprengel, Anl. **2,** pt. 2, 870 (1818) ; Choisy, Prodr. Hyper. 62 (1821) ; Choisy in DC. Prodr. **1,** 556 (1824) ; Sprengel, Syst. **2,** 634 (1825) ; Reichenbach, ap. Moessler, Handb. Gewächsk. **1,** p. lxvii (1827) ; Reichenbach, Consp. 210 (1828) ; Dumort. Anal. Fam. 47 (1829) ; Bartling, Ord. 294 (1830) ; Cambessèdes in Ann. Sc. Nat. **20,** 402 (1830) ; G. Don, Gen. Syst. **1,** 613 (1831) ; Sprengel, Gen. **2,** 803 (1831) ; Spach, Hist. Nat. Végét. Phanér. **5,** 344 (1836) ; Endlicher, Gen. Plant. **2,** 1016 (1836–39) ; Meisner, Gen. 44 (1837) ; Endlicher. Ench. Bot. 528 (1841) ; Reichenbach, Deutsch. Bot. i. Herbarienb. 211 (1841) ; Schnizlein, Iconogr. **3,** 214* (sphalm. 204*) (1843–70) ; Lindley, Veget. Kingd. ed. 2, 406 (1847) ; Cl. Gay, Hist. Chil. **1,** 350 (1854) ; Planchon in Ann. Sc. Nat. sér. 4, **2,** 261 (1854) ; Hooker fil. Fl. Tasm. **1,** 54 (1855–60) ; Loudon, Encycl. Pl. **2,** 1394 (1855) ; Bentham et Hooker fil. Gen. Plant. **1,** 615 (1862) ; Bentham, Fl. Austral. **2,** 446 (1864) ; Baillon, Hist. Pl. **1,** 401 (1867–69) ; Focke in Engler u. Prantl, Natürl. Pflanzenfam. **3,** pt. 6, 131 (1893) ; Reiche, Fl. Chil. **1,** 268 (1895) ; Schneider, Handb. Laubh. **2,** 328 (1909) ; Hallier fil. in Beih. Bot. Centralbl. **39,** 160 (1921) ; Gilg in Engler u. Prantl, Natürl. Pflanzenfam., ed. 2, **21,** 49 (1925) ; Rehder, Manual Tr. Shr. N. Amer. 622 (1927) ; Lemée, Descr. Syn. Pl. Phan. **3,** 34 (1931).—*Carpodontos* Labillardière, Relat. Voy. **2,** 16 (1798) ; id., Pl. Nov. Holl. **2,** 122 (1806) ; Choisy, Prodr. Hyper. 61 (1821) ; De Candolle, Prodr. **1,** 556 (1824) ; Sprengel, Syst. **2,** 634 (1825) ; Reichenbach, ap. Moessler, Handb. Gewächsk. **1,** p. lxvii (1827) ; id., Consp. 210 (1828) ; Dumortier, Anal. Fam. 47 (1829) ; Bartling, Ord. 294 (1830) ; Loudon, Hort. Britt. 225 (1830) ; G. Don, Gen. Syst. **1,** 613 (1831) ; Endlicher, Gen. Pl. **2,** 1016 (1836–1839) ; Meisner, Gen. 44 (1837) ; Endlicher, Ench. Bot. 528 (1841) ; Reichenbach, Deutsch. Bot. i. Herbarienb. 261 (1841) ; Lindley, Veg. Kingd. ed. 2, 406 (1847).—*Pellinia* Molina, Sagg. Chil. ed. 2, 160 (1810).

Trees or *shrubs*, glabrous or tomentose, branchlets opposite, terete. *Leaves* opposite, coriaceous, evergreen in native countries, simple to pinnate, entire or serrate to crenate. *Stipules* always present, connate, interpetiolar, large and caducous. *Flowers* axillary, solitary, stalked, conspicuous, white, peduncle with the exception of one species not visible*. *Sepals* 4, or rarely 5, oblong, concave, thinly coriaceous, rigid, cohering at the apex, and subcalyptrately deciduous, imbricate. *Petals* 4 or rarely 5, large, subhypogynous, broadly ovate-rotundate, straight to oblique, imbricate, membranous. *Stamens* very numerous, inserted many-seriately on a thin pubescent disk, filaments filiform, anthers small, orbicular, versatile. *Ovary* superior, ovoid-conical, 4–14-locular (according to Gilg up to 18), 4–14-sulcate, septicidally 4–14-valved, valves boat-shaped, rostrate with the persistent or partly persistent styles, separating from the placenta-bearing axis, epicarp mostly separating from endocarp, oligospermous. *Seeds* pendulous, oblong, compressed, imbricate, testa margined and produced downwards into a wing. *Embryo* in the axis of sparse fleshy albumen, cotyledons leafy, elliptic, radicle short, superior.

Distribution : Chile, Tasmania (Van Diemen's Land), New South Wales and Victoria. 5 species and 1 hybrid ; 2 hybrids known only in cultivation.

Type Species : *Eucryphia cordifolia* Cav.

III. Key to the Species.

1a. Ovary glabrous, bracts at the base of the pedicel, always 6, peduncle not visible, leaves simple, crenate-dentate..... 8. **cordifolia**

1b. Ovary pubescent, bracts at the base of the pedicel (peduncle not visible), or halfway or nearly halfway up the stalk (peduncle visible), always less than 6.....2

2a. Leaves simple.....3

2b. Leaves compound, leaflets usually 5 or more.....4

2c. Leaves simple and compound on the same plant, usually 3 leaflets in the compound leaves.....5

3a. Bracts 2, peduncle not visible, pedicel twice as long as the fruit, styles 4–5 mm. long, leaves 2·7–5·4 cm. long, but mostly longer than 3·5 cm., entire, oblong to lanceolate, rounded at the base, rounded or slightly emarginate at the apex.....5. **lucida**

3b. Bracts 4 or rarely 5, peduncle not visible, pedicel equalling or rarely longer than the fruit, styles never longer than 1·5 mm., leaves 0·7–1·4 cm. long, entire, elliptic-oblong or rarely

* For the terms pedicel and peduncle I have followed the usage of the late Prof. Dr. J. W. Moll in " Phytography as a Fine Art," 176 (1934). The term peduncle designates all caulomes belonging to the bracteal region which are not pedicels. They may be branched, thus representing cormoid systems, or not, as in the case of *Eucryphia Moorei* F. v. Mueller.

subovate, cuneate or subcuneate at the base, strongly emarginate at the apex, leaves very rarely ternate..... 6. **Milliganii**

3c. Bracts mostly 3, peduncle not visible, pedicel about as long as the fruit, styles 2–3 mm. long, leaves 0·7–2·6 cm. long, entire, oblong to elliptic-oblong, subcuneate or mostly rotundate at the base, rotundate or shortly emarginate at the apex.....7. × **hybrida**

4a. Bracts 4, above or near the middle of the stalk, peduncle always visible, leaflets always entire, 3–13, narrowly elliptic-oblong, petals up to 1 cm. long.....1. **Moorei**

4b. Bracts 4, at the base of the pedicel, peduncle not visible, leaflets always incised-serrate, 3–7, shortly ovate or oblong, petals 2–3 cm. long.....2. **glutinosa**

5a. Leaflets and simple leaves conspicuously serrate, pubescent or puberulous on both surfaces, branchlets with long adpressed hairs.....3. × **nymansensis**

5b. Leaflets and simple leaves entire or slightly toothed in upper half, mature leaflets and leaves glabrous on the lower surface, branchlets glabrous or very shortly pubescent..... 4. × **intermedia**

IV. Enumeration and Description of the Species.

1. E. Moorei *F. v. Mueller*, Fragm. Phytogr. Austral. **4,** 2 (1863–64) ; Bentham, Fl. Austral. **2,** 447 (1864) ; Woolls, Contr. Fl. New South Wales, 107 (1867) ; Baillon, Hist. Pl. **1,** 402 (1867–69) ; Nilson, Timb. Tr. N. S. Wales, 75 (1884) ; Hook. f. in Curt. Bot. Mag. **117,** t. 7200 (1889) ; Maiden, Nat. Pl. Austral. 327, 530 (1889) ; Focke in Engler u. Prantl, Natürl. Pflanzenfam. **3,** pt. 6, 131 (1893) ; Moore, Handb. Fl. N. S. Wales, 180 (1893) ; Gilg in Engler u. Prantl, op. cit. ed. 2, **21,** 49 (1925) ; Ewart, Fl. Victoria, 771 (1930) ; Bean, Tr. Shr. Br. Isl. **3,** 152 (1933) ; Audas, Nat. Tr. Austral. 200 (1935) ; Sandwith in Curt. Bot. Mag. **158,** t. 9411 (1935).

Vernacular names : " dog-rose tree," " wingecarribbee," " white sallow," " acacia," " plumwood," " plum tree " (New South Wales) ; " stinkwood " (Victoria).

Type : New South Wales, in montibus silvaticis originem versus fluviorum Clyde et Shoalhaven River, *C. Moore* (in Melbourne Herb., duplicate seen !)

Evergreen *tree*, up to 26·5 m. high, branches opposite, terete, pruinose. *Branchlets* densely pubescent, apical buds shining glutinous. *Stipules* interpetiolar, ovate, glutinous, brown, very caducous. *Leaves* opposite, imparipinnate with 1–7 pairs (mostly 2–5 pairs) of opposite leaflets, petiolules very short, petioles up to 1·7 cm. long ; petiole, rhachis and petiolules densely villose-pubescent, internodes of rhachis 0·5–2 cm. long ; leaflets narrowly oblong, terminal leaflet narrowly elliptic-oblong, rounded or obtuse and then sharply mucronate-apiculate at the apex (mucro up to

4 mm. long), obliquely obtuse or rounded and unequal-sided at the base, lateral leaflets cuneate and equal-sided at the base. Lowest pair of leaflets mostly very small, the other pairs gradually increasing in length, the terminal leaflet always longest and broadest, 0·8–7·1 cm. long and 0·4–1·5 cm. broad, entire, margins somewhat revolute, chartaceous or thinly coriaceous, green ; shining on the upper surface, on the lower surface pale green or greyish-glaucous, slightly pubescent on both surfaces, especially on the midrib and at the margins, the venation intricately reticulate on upper-, more reticulate on under-surface. *Stipellae* seen on cultivated specimens, up to 1 mm. long, in the axils of the leaflets and sometimes displaced on the petiolule of the leaflet or on the rhachis of the leaf, often foliaceous, up to 5 mm. long, elliptic-oblong, rounded at the apex and mucronate, slightly cuneate at the base, nervature, colour and pubescence the same as in the leaflets. *Flowers* solitary, axillary, stalks up to 3·1 cm. long, spreading pubescent, jointed and bracteate above or near the middle when grown out, when not full-grown the bracts nearly cover the buds, peduncle 0·35–1·6 cm. long. *Bracts* 4, verticillate, ovate, outer pair shorter, rigid, brown, persistent, sometimes glutinous, glabrous or slightly pubescent, 3·5–5 mm. long and 3–4 mm. broad. *Sepals* 4, rigid, brown, greyish-downy at the apex, otherwise glabrous and somewhat shining. *Petals* 4, white, broadly obovate, irregularly crenulate at the apex, 1–1·3 cm. long and broad, scarious. *Stamens* numerous, many-seriate on the raised, dome-shaped receptacle, up to 7 mm. long, glabrous ; at the base of the stamens short scales, which are outgrowths of the receptacle, and are clothed with long soft hairs near their apex ; anthers short, versatile. *Ovary* ovoid or ovoid-ellipsoid, densely adpressed pilose-tomentose, 7–9-locular (mostly 7-locular), 3·5–4 mm. long and 2 mm. in diam. ; styles 7–9, glabrous, up to 3·5 mm. long. *Capsule* coriaceous to ligneous, oblong and somewhat compressed, 1–1·55 cm. long, 7–9-locular (mostly 7-locular), 7–9-sulcate, septicidally 7–9-valved ; each valve glabrous and flat at the sides, slightly tomentellous at the back. *Fertile seeds* in each valve mostly 2, sometimes 3 or 4, winged, dark brown, shining, glabrous, slightly compressed, rhombic-ovate, 3·5–5 mm. long.

Flowers : February–April.

Distribution : New South Wales and Victoria.

New South Wales. Richmond County : Richmond River, no date (Wh.). Camden County : Macquarie Pass, August 1917, *Cleland* s.n. (N.Y.) ; Hasting River, no date, *Betche* 63 (M.) ; Burrawang, Nov. 1888, *Maiden* s.n. (K.) ; Bundanoon, Nov. 1923, *C. F. Laseron* s.n. (K.) ; Meryla, 15 miles south of Moss Vale, July 1892, *Wing* s.n. (K.) ; Cambewarra Range, between Nowra and Kangaroo Valley, in brush forest, 330 m., March 1930, *Rodway* s.n. (K.). St. Vincent County : Clyde River, no date, *C. Moore* (K., dupl. type !) ; Sugarloaf Mtn., Braidwood, May 1890, *Bauerlen* s.n. (K.) ; ibid., Feb. 1893, *Bauerlen* s.n. (K.) ;

Monga or Sugarloaf Mtn., near Braidwood, Feb. 1909, *Boorman* s.n. (L., St., Wh., M.); Braidwood, Feb. 1909, *Boorman* s.n. (Br.M.); Clyde, Mt. Clyde Rd., *Boorman* s.n. (Wh.); Bateman's Bay, Clyde Mt., 550–600 m., April 1932, *Rodway* 768 (K.). DAMPIER COUNTY: Tilba-Tilba (Cape Dromedary), Nov. 1911, *Boorman* s.n. (Br.M.).

VICTORIA. Cape Howe Range, April 1871, *C. Walter* s.n. (Br.M.).

From Victoria I have seen only one specimen; Prof. Ewart in his "Flora of Victoria" writes that the species is confined there to Eastern Victoria, where it is uncommon near Mallacootta; it is one of the coastal extensions of the N.S. Wales flora into Victoria. After his first collection (about 1860) in N.S. Wales, Charles Moore made another collection, according to a note in Mueller's handwriting in an interleaved copy of vol. 2 of Bentham's Flora Australiensis (1864) at Kew, which gives the following additional information: "Recently found (again) by Moore at Wingecaribbee, where it forms a tree, 80 ft. high, with stems 2 ft. in diam.; also by Mr. Woolls at 'Sassafras place,' 15 miles from Berrima, consociated to *Fieldia, Doryphora, Dicksonia, Schizomeria, Quintinia* and *Lomatia Patersonii*." This was confirmed by Mr. Woolls himself in "Remarks on the Botany of Berrima and the Mittagong Range," reprinted in his "Contributions to the Flora of Australia," 107–8 (1867). The specimen from Richmond River (Wh.) has never been cited: it considerably extends the known range of this species, given by Sandwith in Bot. Mag. l.c.

Boorman's specimen from Braidwood (Br.M.) occasionally seems to show 2 instead of 1 flower per axil: this may be due to bad or non-development of an internode. The mature leaflets on this specimen are unusually small (8 mm. long and 6 mm. broad).

2. E. glutinosa (*Poepp. et Endl.*) *Baillon*, Hist. Pl. **1,** 402 (1867–69); Sandwith in Curt. Bot. Mag. **158,** t. 9411 (1935).—*Fagus glutinosa* Poepp. et Endl., Nov. Sp. et Gen. **2,** 68, t. 194 (1838–45); Bot. Zeit. **6,** 130 (1848); Beih. Bot. Zeit. 6 (1848).—"*Fagus glandulosa* Poepp. et Endl.," Reiche, Flor. Chil. **1,** 28 (1895).—*E. pinnatifolia* Gay, Hist. Chil. **1,** 352 (1854); Walpers, Ann. Bot. Syst. **1,** 113 (1848–49); Baillon in Adansonia, **5,** 303 (1864–65); Gard. Chron. ser. 3, **1,** 337 (1880); Hooker in Curt. Bot. Mag. **115,** t. 7067 (1889); Gard. Chron. ser. 3, **22,** 246 (1897); Mitt. Deutsch. Dendr. Ges. **9,** 96 (1900); Gard. Chron. ser. 3, **54,** 284 (1913); Bean, Tr. Shr. Br. Isl. **1,** 536 (1914); Mitt. Deutsch. Dendr. Ges. **26,** 230 (1917); id. **28,** 124 (1919); Gard. Chron. ser. 3, **80,** 166 (1926); id. **81,** 123 (1927); id. **82,** 130 (1927).—"*E. pinnatifida* Gay," Schnizlein, Iconogr. **3,** t. 214* (sphalm. 204*) (1854).—"*E. glandulosa* (Poepp. et Endl.) Focke," Reiche, Fl. Chil. **1,** 268 (1895); Hauman in Rec. Inst. Bot. Errera, **9,** 360 (1913).—*E. glutinosa* (Poepp. et Endl.) Focke in Engl. u. Prantl, Natürl. Pflanzenfam. **3,** pt. 6, 131 (1893); Schneider, Handb. Laubh. **2,** 329 (1909); Gilg in Engler u. Prantl,

Natürl. Pflanzenfam. ed. 2, **21,** 49 (1925) ; Rehder, Manual Tr. Shr. N. Amer. 623 (1927) ; Mitt. Deutsch. Dendr. Ges. **40,** 284 (1928).

Vernacular Name : " nirrhe " (Pehuen Indians, Chile).

Type : Chile, Andes antucenses, in rupium fissuris Pico de Pilque, Jan. 1829, *Poeppig* 868B (in Herb. Mus. Vindob.).

Small tree or *shrub,* 8–10 m. in height, evergreen in native country, in culture often deciduous, branches many, decussate or subverticillate, seldom alternate, monochasial sympodium or dichasium, terete, under pressure subterete or angulate, pruinose, ramentaceous or glutinous, purplish-brown and glabrous. *Branchlets* lighter brown and adpressed pubescent, short annual cicatrices, tuberculate. *Stipules* ovate-oblong to ovate-lanceolate or lanceolate, very acute, pubescent especially at the apex, deciduous, brown, about 1·5 cm. long and 0·5 cm. broad, interpetiolar. *Petioles* 0·4–1·3 cm. long, adpressedly pubescent. *Leaves* crowded towards the end of the branchlets, opposite, imparipinnate with 2 (sometimes only 1) pairs of opposite leaflets, lateral leaflets subsessile or mostly sessile, internodes of the rhachis up to 1·4 cm. long, rhachis densely adpressedly pubescent. *Lateral leaflets* elliptic to elliptic-oblong, apex acute or sometimes slightly obtuse (type !), base unequally rotundate, 1·2–5·4 (mostly 3·5–4) cm. long and 0·8–2·1 cm. broad. *Terminal leaflet* rather longer elliptic, apex acute, seldom obtuse (type !), base very cuneate (sometimes nearly rounded or even revolute cordate : *Cabrera* 3678) into a pubescent petiolule (which is about 0·3–1·2 cm. long), 1·7–5·6 cm. long and 1·4–2·8 cm. broad. All leaflets crenately toothed or serrate, sometimes nearly mucronate-serrate, dark shiny green, on the upper surface (especially on the main and lateral nerves) adpressedly pubescent, on the lower surface same pubescence, same colour or paler, venation conspicuous. *Flowers* solitary, axillary ; pedicels up to 1·2 cm. long, but mostly shorter, pubescent. *Bracts* 4, at the base of the pedicel (peduncle never visible), verticillate, caducous, rigid, brown, ovate, acute at the apex and revolute at the margins, densely adpressedly pubescent, up to 8 mm. long and 7 mm. broad. *Sepals* 4, broadly oblong, obtuse, up to 1·4 cm. long and 6 mm. broad, tomentose at the apex and margins, coriaceous, imbricate, greenish-brown, deciduous. *Petals* 4, white, orbicular-ovate, concave, up to 3·2 cm. long and 3·3 cm. broad, entire at the apex, very much imbricate and scarious. *Stamens* very numerous, capillary, glabrous, up to 2·5 cm. long, many-seriate on the raised dome-shaped receptacle, each filament surrounded by a short, tubular effiguration of the thalamus ; anthers short, orbicular, versatile, bright yellow, after flowering red. *Ovary* ovoid-oblong, densely adpressedly pilose-tomentose, 8–14-locular (according to Gilg up to 18), finely furrowed, up to 5 mm. long and 2–2·5 mm. in diam. *Styles* 8–14, filiform, pubescent in lower part, sparsely pubescent in upper part, up to 1·7 cm. long, stigmas minute. *Capsule* brown or purplish-brown, coriaceous to ligneous, oblong-obovoid to obovoid, somewhat compressed at the

base, 1·4–1·8 cm. long and up to 0·9 cm. in diam. *Pedicel* of mature fruits 1·2–1·8 cm. long, adpressedly pubescent, terete. *Capsule* septicidally 8–14-valved, conspicuously 8–14-sulcate, valves adpressedly pubescent at the back, glabrous at the sides; epicarp splitting off from the endocarp, the latter remaining attached to the central axis by means of two filaments in only a few specimens; mostly epicarp and endocarp remain united; endocarp from each valve, besides splitting septicidally, also splitting loculicidally (along the midrib) about 1 or 2 mm. from the apex. *Seeds* rhombic-ovate, dark brown, winged, very compressed, shining, glabrous, up to 5 mm. long, 2–5 fertile seeds in each valve.

According to Gilg the ovary is up to 18-locular. I have, however, never seen this unusually high number on any of the herbarium specimens or on the living material and I do not think it advisable to mention this number as common.

Flowers: January, February.

Distribution: Chile, from 27°–38° S. lat.

Prov. Atacama: Santa (Aguada) Gertrudis, no date, no collector. (K.) Doubtful locality! Prov. Nuble: San Ignacio, Renaico Valley, no date, *Elwes* s.n. (K.); Palo Santo, near San Ignacio, Renaico Valley, on river bank, 200 m., Jan. 1902, *Elwes* s.n. (K.); Recinto, Junte al rio Renegado, Feb. 1936, *Cabrera* 3678 (St.); Chillan, no date, *Philippi* s.n. (B.). Prov. Malleco: Andes, near Copahue, 1895, *F. W. Neger*, s.n. (M.); near Araucamien, 1896, *F. W. Neger*, s.n. (M.). Prov. Bio Bio: Pico de Pilque (Cerro del Pilque), in cold regions, Jan. 1829, *Poeppig* 868 B (W., type); Cuesta Alul, 1885, *Philippi et Borchers* (C., Br. M.). Without locality: 1824–34, *Cl. Gay* 1251 (N.Y.); 1904, *Philippi* s.n. (Br. M.); no date, *Cl. Gay* s.n. (K., B.).

The type, *Poeppig* 868 B, is a very much stunted and reduced specimen; the terminal leaflets never exceed 2·7 cm. in length and are often much smaller, also simple leaves occur occasionally. However I do not hesitate in accepting this specimen as the type, as it was collected in very cold regions, at least 1000 ft. above sea-level, even though the original description has to be modified considerably to cover all the other specimens, which have larger, more elliptic leaflets. The specimen from Santa Gertrudis, Prov. Atacama, shows an exact match of the type at the end of a sympodial branch. The locality of this specimen is doubtful, though not impossible.

This species has been in cultivation in England since 1851, introduced by Pearce. Cultivated specimens often differ from the original Chilean material in having the leaflets narrower and longer. On cultivated material foliaceous stipellae occur, up to 3 mm. in length. In culture is also known the double-flowered form: *Eucryphia glutinosa* (Poepp. et Endl.) Baill. var. *plena* Hort.

3. × **E. nymansensis** *Bausch* (**E. glutinosa** (*Poepp. et Endl.*) *Baill.* × **cordifolia** *Cav.*), hybr. nov.; inter parentes ob folia

heteromorpha optime intermedia, ad illam ob folia composita sed plerumque 3-foliolata, dentaturas argutas, ovarium albido-villosum, ad hanc ob folia nonnulla simplicia, foliola subtus glaucescentia approximans.—*E.* " Nymansay " Comber in Gard. Chron. ser. 3, **76,** 161 (1924), et l.c. 154 (1924) ; id. **80,** 177 (1926).—" *E.* nymansay " Messel ex Bean, Tr. Shr. Br. Isl. **3,** 153 (1933).

Arbor parva, sempervirens, statura incerta, ramulorum cortice hic illic pruinoso. *Stipulae* lineari-lanceolatae, pubescentes, ad 1·5 cm. longae, circuitu 2 mm. latae. *Folia* simplicia vel composita vel in eodem pari alterum simplex cum altero composito. *Folia simplicia* elliptico-oblonga vel elliptico-lanceolata, apice acuta, basi plerumque rotundata, saepe cuneata, rarius aliquantum cordata, ad 6·3 cm. longa, subcoriacea, argute serrata, subtus glaucescentia, venulis supra intricatis sed quam in *E. cordifolia* minus crasse reticulatis. *Folia composita* plerumque 3-foliolata, rarius 2–7-foliolata, foliola lateralia nunc petiolulata nunc subsessilia vel sessilia, forma atque magnitudine valde variabilia, oblonga, elliptico-oblonga, ovato-oblonga vel fere suborbicularia, apice mucronata ; foliolum terminale lateralibus 1·5–3-plo longius, elliptico-oblongum usque ovato-lanceolatum, apice acutum vel rotundatum, mucronatum, basi cuneatum usque rotundato-truncatum, usque 7·8 cm. longum et 3·6 cm. latum ; foliola omnia dentaturis textura venatione colore foliis simplicibus similia. *Bracteae* 4–5, basi pedicellorum positae. *Pedunculus* haud visibilis. *Pedicelli* 0·9–1·9 cm. longi. *Sepala* usque ad 1·4 cm. longa, apicem versus adpresse pubescentia. *Petala* alba, 2–3·5 cm. longa, 1·5–3·3 cm. lata. *Stamina* usque 1·6 cm. longa ; antherae aureae. *Ovarium* ovoideum, albido-villosum, 9–12-loculare ; styli 9–12, glabri, usque 8 mm. longi, stigmatibus minutis. *Fructus* nondum visus.

Cult. in hort. Nymans, Handcross, Sussex, comm. *Lt. Col. L. C. R. Messel*, August 30th, 1930 (typus in Herb. Kew.) ; ex eodem origine, August 27th, 1924 (K.). Hybrid known only in cultivation.

Flowers in July and August.

Mr. J. Comber, in a letter to the writer, explained how the fancy name " Nymansay " originated. It was Lt. Col. Messel's idea to call the seedlings of this hybrid respectively Nymans A, Nymans B, Nymans C, and so on. In order to make it look more like a name, " Nymans A " was altered to " Nymansay." It is therefore clear that " Nymansay " is not a scientific name. The epithet *nymansensis* has accordingly been chosen and has been validated by a latin description.

4. × **E. intermedia** *Bausch* in Kew Bull. 1937, 193.—*E.* " Rostrevor " Hort., Gard. Chron. **100,** 187 (1936) ; Journ. Roy. Hort. Soc. **61,** 439 (1936). Type : Cult. in Hort. Bot. Reg. Kew., January 1937, *J. Bausch* (K.).

E. glutinosa (Poepp. et Endl.) Baill. × *lucida* (Labill.) Baill., a good intermediate, approaching the former in the possession of pinnate leaves, 2–5-foliolate, mostly 3-foliolate, the leaflets being often toothed especially in upper half; the latter in the leaves being glaucescent on the lower surface, some of them small and simple, oblong, shortly petiolate and usually quite entire.

Small tree, semi-evergreen to evergreen, height not known; branchlets in living state subterete and somewhat compressed, after pressure ribbed and angular, brown, slightly pruinose, glabrous below, pubescent above with subadpressed hairs. *Stipules* ovate, acute, glabrous, brown, 5–7 mm. long and 3·5–4·5 mm. broad. *Leaves* glaucescent on under surface, margins weakly pilose, otherwise glabrous or pubescent above when young; venation evident as in *E. glutinosa*; uppermost and younger pairs of leaves often as in *E. lucida* small, simple, oblong, rounded and usually very shortly emarginate with 2 small teeth at the apex, more rarely entire, obtuse or acute, cuneate at the base and narrowed into a pubescent petiole (which is about 3–5 mm. long), sometimes rounded, 1·4–5·85 cm. long and 0·5–2·4 cm. broad, usually entire, more rarely toothed in the upper half or towards the apex; sometimes the same pair is composed of a pinnately-foliolate and a simple leaf, the latter being similar to the other simple leaves or more rarely cordate at the base. Pinnate leaves with a pubescent petiole, 0·4–1·1 cm. long; lateral leaflets subsessile, elliptic-oblong, usually obtuse, rarely acute and always shortly apiculate at the apex, rounded or subtruncate and somewhat oblique at the base, 1·2–3·8 cm. long and 0·5–1·7 cm. broad, the smaller ones entire, the larger ones subentire or sharply serrate in the upper half; the terminal leaflet with a pubescent petiolule, which is 2–5 mm. long or in the 2–4-foliolate leaves subsessile and very oblique at the base, elliptic, elliptic-oblong or oblong-lanceolate, usually obtuse and shortly apiculate or emarginate at the apex, acute and cuneate to rounded at the base, 2·2–6·3 cm. long, always 1·5–2 times longer than the lateral leaflets, 0·6–3 cm. broad, entire or toothed as in *E. glutinosa* in the upper half of the leaflet or often only towards the apex. *Inflorescence* not seen, petals white, a little larger than those of *E. lucida*.

Distribution: Known only in cultivation. Cult. in Hort. Bot. Reg. Kew., Jan. 1937, *Bausch* s.n. (K., type); cult. in Hort. Nymans, Handcross, Sussex, April 1937, *Bausch* s.n. (K., duplicates not yet distributed).

5. E. lucida (*Labill.*) *Baillon*, Hist. Pl. **1,** 402 (1867–69); Maximowicz in Act. Hort. Petrop. **6,** 257 (1876); Gilg in Engl. u. Prantl, Natürl. Pflanzenfam. ed. 2, **21,** 49 (1925); Sandwith in Curt. Bot. Mag. **158,** t. 9411 (1935).—*Carpodontos lucida* Labillardière, Relat. Voy. **2,** 16 (1798); idem, Pl. Nov. Holl. **2,** 122 (1806); Choisy, Prodr. Hyper. 62 (1821); De Candolle, Prodr. **1,** 556

(1824) ; G. Don, Gen. Syst. **1,** 613 (1831).—*E. Billardieri* Spach, Hist. Nat. Végét. Phanér. **5,** 345 (1836) ; Hooker fil., Fl. Tasm. **1,** 54 (1855) ; Bentham, Fl. Austral. **2,** 446 (1864) ; Hooker f. in Curt. Bot. Mag. **67,** t. 7200 (1891) ; Meredith, Bush Fr. Tasm., last ser., 36 (1891) ; Focke in Engler u. Prantl, Natürl. Pflanzenfam. **3,** pt. 6, 131 (1893) ; Pritzel in Engler, Bot. Jahrb. **24,** 356 (1897) ; Gard. Chron. ser. 3, **22,** 246 (1897) ; Rodway, Tasm. Fl. t. 15 (1903) ; Bean, Tr. Shr. Br. Isl. **1,** 535 (1914) ; Record and Mell, Timb. Trop. Am., 432 (1924) ; Bean, Tr. Shr. Br. Isl. **3,** 152 (1933) ; Audas, Nat. Tr. Austral. 200 (1935).—*E. lucida* (Labill.) Druce in Rep. Bot. Exch. Cl. Brit. Isl. 1916, **4,** Suppl. 2, 622 (1917).

VERNACULAR NAMES : " pinkwood," " leatherwood " (Tasmania).

TYPE : Nouvelle Hollande, Côte S.O., *Labillardière* (in Herb. Mus. Paris).

Evergreen tree, up to 34 m. high, usually 10–15 m., trunk straight, up to 2 m. in circumference. *Branches* glabrous, brown, terete or subterete, slightly pruinose ; young foliage-bearing branchlets very numerous, light brown, adpressedly pubescent, buds very resinous. *Stipules* interpetiolar, ovate, acute, brown, slightly adpressedly pubescent, 2·5–4 mm. long and about 2 mm. broad. *Petioles* round, glabrous or puberulous, 2–6 mm. long. *Leaves* simple, opposite, narrowly oblong (nearly linear-oblong) to elliptic-oblong, broadest in lower half, always at least 3 times longer than broad, coriaceous, entire, ciliate on the margins ; adpressedly pubescent, dark green and shining on the upper surface, on the lower surface very glaucous, glabrous, the venation not conspicuous ; obtuse or subacute and sometimes minutely bidentate at the apex, truncate or rounded and very rarely almost cuneate at the base ; 2·7–5·4 cm. long and 0·8–1·7 cm. broad. *Flowers* solitary, axillary, stalks up to 1·4 cm. long, but mostly shorter, pubescent ; bracts 2, at the base of the pedicel (peduncle not visible), verticillate, ovate, slightly rounded and ciliate at the apex, otherwise glabrous, persistent, brown, rigid, up to 5 mm. long and broad. *Sepals* 4, broadly oblong, tomentellous especially at the apex, about 8 mm. long. *Petals* 4, broadly ovate to rotundate, broadly rounded and somewhat crenulate at the apex, scarious, white, up to 2·1 cm. long and broad (very rarely 5-petalled flowers occur, *e.g.*, on *Gunn* 272 from Lake St.-Clair, 1845 ; this is, however, too rare to be a constant character). *Stamens* very numerous (30–50), up to 8 mm. long, filaments glabrous, surrounded at the base by short, tubular effigurations of the thalamus, anthers short, versatile. *Ovary* ovoid-oblong, adpressedly villose-tomentose, up to 4·5 mm. long and 1·5 mm. in diameter, 5–7- (mostly 5-) locular. *Styles* 5–7, filiform, glabrous, up to 5 mm. long, stigmas minute. *Pedicel* of the fruit at least 1·5–2·5 times longer than the fruit, adpressedly pubescent, in dried state very angulate. *Capsule* ligneous, oblong or linear-clavate and somewhat compressed at the base, up to 1·4 cm. long and 6 mm. in

diameter, septicidally 5–7-valved, 5–7-sulcate, light brown or almost yellowish ; valves slightly hairy at the back, glabrous at the sides, fissile and minutely bidentate at the apex ; epicarp very occasionally splitting off from the endocarp in mature stage ; endocarp, besides splitting septicidally, splitting also loculicidally at the apex, but never for more than 1 mm. *Fertile seeds* mostly 1 or 2 in each valve, ovate-oblong, winged, very compressed, dark brown, shining, glabrous, up to 4·5 mm. long.

In Hooker's "Flora of Tasmania," **1,** 54 (1855), the name *Eucryphia lucida* occurs twice, as "*E. lucida*," in a short note under the species *E. Milliganii*. Evidently, however, Hooker did not have the intention of making this combination, as he gave the description of the species in question under the thick printed name *Eucryphia Billardieri* Spach ; *i.e.*, under the circumstances he was following the Kew Rule, placing *Carpodontos lucida* Labill. in the synonymy. The name "*E. lucida*" probably was an accidental mistake for *E Billardieri*, and therefore, although Hooker used the new combination about 12 years earlier than Baillon, the authorship for it, according to the International Rules of Botanical Nomenclature, cannot be attributed to Hooker.

Flowers : February–March.

Distribution : Tasmania, mountainous districts, especially in the interior and towards the west, south and east coasts.

Wellington : Hampshire Hills, near Emu River, Feb. 1837, *Gunn* 272 (K.) ; ibid., Feb. 1842, *Milligan* 134 (K., N.Y.). Russell : Mt. Bischoff, near Waratah, re-growth of scrub, 530 m., March 1929, *Comber* 1943 (K.). Montagu : Zeehan, W. Coast, open hillside, wet country, 170 m., Feb. 1930, *Comber* 2055 (K.) ; Macquarie Harbour, at entrance and on margins of rivers, Feb. 1847, *Milligan* 134 (Br. M., K., N.Y.) ; Macquarie Harbour, W. coast, in damp shaded woods, Jan. 1819, *Cunningham* s.n. (Br. M., K.). Lincoln : Lake St.-Clair, 1833, *Gunn* 272 (K.) ; ibid., central plateau, western shore, in forest, 830 m., Jan. 1915, *Gibbs* 6603 (K., Br. M.) ; ibid., southwest, Feb. 1845, *Gunn* 272 (K., O.) ; ibid., April 1842, *Gunn* 272 (Br. M., C., N.Y.). Montgomery : Birch Inlet, Macquarie Harbour, Dec. 1846, *Milligan* 134 (C., K.). Buckingham : National Park, path to plateau, in forest, 660 m., March 1928, *Giblin* s.n. (K.) ; ibid., on low moist sheltered place, Dec. 1929, *Comber* 1943 (K.) ; Huon River, Feb. and Dec. 1876, *J. E. J. Woods* s.n. (O.). Kent : Porte de l'Esperance, on banks of larger rivers, 1804, *Brown* 5217 (B., Br. M., K., N.Y.) ; ibid., near Storm Bay Passage, no date, *Brown*, s.n. (K.) ; South Port, no date, *Stuart* s.n. (N.Y.). Dorset : Launceston, 1843, *Archer* s.n. (L.). Cornwall : Ben Lomond, 1840, *Archer* s.n. (L.).

Without exact locality or date : S.W. coast, Nova Hollandia, *Labillardière* s.n. (B.K., P. (type), St., Br. M., M.) ; 1832, *Lambert* s.n. (K.) ; no date, *R. C. Gunn* s.n. (B., C., N.Y., O., St., M.) ;

id., *A. Cunningham* s.n. (K.) ; id., *Forster* s.n. (St.) ; id., *Dr. Hooker* s.n. (N.Y.) ; id., *Archer* s.n. (O., Wh.) ; id., *Sutton* 296 (K.).

Cultivated : Hort. Bot. Reg. Kew., June 11th, 1891, type for Curt. Bot. Mag. t. 7200 (*E. Billardieri* var. *Milligani* (Hook. f.) Benth.) (K.).

6. E. Milliganii *Hook. f.*, Fl. Tasm. **1,** 54 (1855) ; Schnizlein, Iconogr. **3,** t. 214* (sphalm. 204*) (1854) ; Maximowicz in Act. Hort. Petrop. **6,** 254 (1876) ; Sandwith in Curt. Bot. Mag. **158,** t. 9411 (1935).—*E. Billardieri* Spach var. *Milligani* (Hook. f.) Bentham, Fl. Austral. **2,** 446 (1864) ; Hooker f. in Curt. Bot. Mag. **117,** t. 7200 (1891) ; Gard. Mag. Dec. 31, 1892.—*E. lucida* Druce var. *Milliganii* Summerhayes in Handlist Tr. Shr. Roy. Bot. Gard. Kew (1934) ; My Garden **34,** 262 (1936).

Type : *Gunn* 1034, in forest east of Franklin River, W. Macquarie Harbour, April 14th, 1842 (in Herb. Kew.).

Evergreen tree or *shrub*, up to 14 m. in height, densely branched, branches terete, glabrous, blackish-brown. *Branchlets* terete, subterete or slightly angular, glabrous or thinly adpressedly pubescent, light brown and covered with a resinous substance from the buds. *Stipules* interpetiolar, ovate, acute, pubescent especially at the apex, blackish-brown, never longer than 1 mm. *Petioles* never longer than 2 mm., glabrous or shortly adpressedly pubescent. *Leaves* simple, opposite, very crowded especially towards the ends of the branchlets, elliptic-oblong or rarely subovate, coriaceous, length very seldom exceeding twice the breadth, broadest in the middle, rounded and strongly emarginate at the apex, cuneate or subcuneate at the base ; on the upper surface dark green, shining, puberulous or glabrous, on the under surface very glaucous, glabrous and reticulate, venation both on upper and under surfaces more conspicuous than in *E. lucida* ; 0·4–1·4 cm. long and 0·2–0·6 cm. broad. *Flowers* solitary, axillary ; pedicel bracteate at the base, up to 0·7 cm. long, finely pubescent, peduncle not visible. *Bracts* 4 (accidentally 5), very much imbricate, brown, rigid, persistent, the 2 external ones ovate, acute, viscid and hardly pubescent, 1–1·5 mm. long and 1 mm. broad ; the 2 internal ones linear-ovate, acute, ciliate-pubescent, up to 2 mm. long and 1 mm. broad. *Sepals* 4, broadly ovate to oblong, obtuse, and densely villose at the apex, rigid, brown, margins on the upper and under surface slightly hairy, up to 4 mm. long and 1·5–2 mm. broad. *Petals* 4, scarious, white, broadly ovate, broadly rounded and quite entire at the apex, about 8 mm. long and broad. *Stamens* numerous, seldom more than 20, filaments up to 4 mm. long, glabrous, surrounded by shortly tubular, ciliate effigurations of the thalamus, anthers short, versatile, reddish-brown, always as large as in *E. lucida*. *Pollen-grains* very minute, hyaline and elliptic. *Ovary* ovoid-oblong to oblong, densely adpressedly villose, up to 2 mm. long and 1·5 mm. in diam., 4–5- (mostly 4-) locular. *Styles* 4–5, filiform, glabrous, up to 1·5 mm.

long, stigmas minute. *Capsule* coriaceous to ligneous, ovoid-oblong and somewhat compressed at the base, up to 1 cm. long and 3·5 mm. in diam. *Pedicel* never longer than the fruit, slightly pubescent and terete. *Fruit* septicidally 4–5-valved, 4–5-sulcate, dark brown, valves pubescent on the back, glabrous at the sides; epicarp in mature fruits always splitting off from the endocarp, endocarp besides splitting septicidally also splitting loculicidally about $\frac{1}{4}$–$\frac{1}{3}$ of its length. *Fertile seeds* 0–2 in each valve, up to 3 mm. long, very shortly winged, dark brown, glabrous, rhombic-ovate, compressed towards the wing.

Flowers: February–May.

Distribution: Tasmania, interior and towards the South and West Coast.

Russell: Heazlewood River, near Waratah, at edge of river, with *Comber* 2186, 200 m., March 1930, *Comber* 2187 (K.). Montague: Lake Margaret Pipe Line, N. of Queenstown, W. Coast, 500 m., Feb. 1930, *Comber* 2148 (K.); ibid., 660 m., Feb. 1930, *Comber* 2151 (K.). Franklin: Mount Sorell, near Gordon River and Macquarie Harbour, Jan. 1847, *Milligan* 725 (Br., M. K., L., N.Y., U.); Franklin River, east, near Macquarie Harbour, *Gunn* 1034 (K. (type!), C., O., St., M.). Buckingham: National Park, open place, Dec. 1929, *Comber* 1944 (K.); ibid., in open forest, 930 m., Dec. 1929, *Comber* 1945 (K.); ibid., leaves smallest seen, Dec. 1929, *Comber* 1946 (K.); ibid., in moist forest, still in flower, 1000 m., May 1930, *Comber* 2373 (K.). Kent: Hartz Mountains, 700 m., March 1930, *Comber* 2252 (K.); Adamson's Peak, exposed tableland, 700 m., March 1872, *J. R. Scott* s.n. (O.); Mount Lapeyrouse, Van Diemen's Land, no date, *Stuart* s.n. (K., O.); Acheron River, Feb. 1845, *Gunn* 1034 (O.); ibid., no date, *Milligan* 359 F (O.).

I certainly consider *E. Milliganii* Hook. f. as a separate species from *E. lucida* (Labill.) Baill., and I cannot agree with the opinion of certain botanists during recent years, that this plant merely represents a stunted, alpine variety of *E. lucida*. In several respects they are totally different; differences in elevation, alpine conditions, etc., could hardly transform a species into a plant like this. The two species are nevertheless very closely related. *E. Milliganii* is frequently associated in the forest flora with *E. lucida*; the former reaches an altitude of 3500 ft., whilst the latter occurs up to 2000 ft. in elevation; these two species may thus easily give rise to the hybrid, described below as × *E. hybrida* Bausch. The main points on which I differentiate them are: the number of bracts, in *E. lucida* 2, in *E. Milliganii* 4; differences in shape and size of the leaves, the apex and the base; size of flowers, length of the pedicel of the fruit in proportion to the fruit itself; further the leaves are much more crowded in *E. Milliganii* than in *E. lucida* and the method of splitting of the epicarp and the endocarp in the valves of the capsules is different. In *Comber* 1946, on some branches towards the apex, ternate-pinnate or bifoliolate leaves occur.

The specimen in question was a young shoot from a cut stump, and abnormalities like this may be found on any plant which has been badly damaged. The shape of the leaflets in these pinnate leaves is rather more ovate than in the simple leaves. *Comber* 1946 bears the smallest leaves ever seen by Mr. Comber or myself; they are here on the average only 5–6 mm. long and 2–3 mm. broad.

7. × **E. hybrida** *Bausch* (**E. lucida** (*Labill.*) *Baill.* × **Milliganii** *Hook. f.*), hybr. nov.; inter parentes magnitudine formaque foliorum necnon corollae magnitudine intermedia.—*E. Milliganii* Hook. f. Fl. Tasm. **1,** 54 partim, t. viii, quoad f. A (1855).

Frutex vel *arbor parva*, sempervirens, usque 13 m. alta, ramulis foliiferis valde numerosis, internodiis brevibus, foliis fere ut in *E. Milliganii* congestis. *Folia* oblonga vel elliptico-oblonga, apice rotundata et breviter emarginata, basi cuneata vel rotundata, 0·7–2·6 cm. longa, 0·3–1·1 cm. lata; petiolus 1·5–5 mm. longus. *Bracteae* plerumque 3, basi pedicellorum positae. *Pedicelli* 5–8 mm. longi. *Petala* 0·8–1·35 cm. longa, usque 1·4 cm. lata. *Capsula* 1–1·5 cm. longa, pedicello 1–1·1 cm. longo. *Ovarium* 5–6-loculare; styli 5–6, usque 2 mm. longi.

Flowers: February–May.

Distribution: Tasmania.

Heazlewood River, near Waratah, at edge of river, 200 m., March 3rd, 1930, *Comber* 2186 (type, K.); Gordon River, Macquarie Harbour, Jan. 3rd., Feb. 7th, and March 1st, 1847, *Milligan* 724 (Br. M., K., L., N.Y.); National Park, 1925, *Mrs. Lindon* H. 273 (K.); ibid., in open woodland on steep mountainside, 830 m., Dec. 11th, 1929, *Comber* 1857 (K.); ibid., in moist forest, 1000 m., May 6th, 1930, *Comber* 2372 (K.); Hartz Mountains, by stream on summit plateau and slopes, 660–1160 m, Feb. 1915, *Gibbs* 6792 (Br. M., K.); ibid., near top of mountain, the last tree met with, 830 m., March 28th, 1930, *Comber* 2236 (K.).

Without precise locality or date: *C. Stuart* s.n. (K.).

Type: Heazlewood River, near Waratah, 200 m., March 3rd, 1930, *Comber* 2186 (in Herb. Kew.).

8. E. cordifolia *Cav.* Icones, **4,** 49, t. 372 (1797); St.-Hilaire, Expos. **2,** 24 (1805); Persoon, Synops. Plant. **2,** 92 (sphalm. *Eucriphia*) (1807); Poiret, Encycl. Méthod. Suppl. **2,** 594 (1811); Choisy, Prodr. Hyper. 62 (1821); Choisy in DC. Prodr. **1,** 556 (1824); Sprengel, Syst. **2,** 634 (1825); G. Don, Gen. Syst. **1,** 613 (1831); Spach, Hist. Nat. Végét. Phanér. **5,** 346 (1836); Gay, Hist. Chil. **1,** 351, t. 8 (1854); Schnizlein, Iconogr. **3,** t. 214* (sphalm. 204*) (1854); Baillon in Adansonia, **5,** 303 (1864–5); Philippi in R. Bot. Zeitung, **22**. 12 and 22 (1864); Bentham et Hooker fil. Gen. Plant. **1,** 615 (1865); Baillon, Hist. Pl. **1,** 402 (1867–69); Maximowicz in Act. Hort. Petrop. **6,** 257 (1876); Reed, Hist. Nat. Chil. 101 (1892); Focke in Engler u. Prantl, Nat. Pflanzenfam. **3,** pt. 6, 131 (1893); Reiche, Fl. Chil. **1,** 268 (1895); Gard. Chron. ser. 3, **22,**

24 (1897) ; Pritzel in Engl. Bot. Jahrb. **24,** 355 (1897) ; Gard. Chron. ser. 3, **42,** 259 (1907) ; Castillo et Dey, Jeogr. Vej. Rio Valdivia, ed. 2, **6,** 80 (1908) ; Gard. Chron. ser. 3, **44,** 129 (1908) ; Stapf in Curt. Bot. Mag. **134,** t. 8209 (1908) ; Schneider, Ill. Handb. Laubh. **2,** 326–8 (1909) ; Hauman in Rec. Inst. Bot. Errera, **9,** 363 (1913) ; Bean, Tr. Shr. Br. Isl. **1,** 535 (1914) ; Gotschlich in Bol. Mus. Nac. Chil. Santiago, **6,** 232 (1914) ; Mitt. Deutsch. Dendr. Ges. **25,** 184 (1916) ; Hauman in Trab. Inst. Bot. Sc. Buenos Aires, **34,** 25 (1916) ; Gard. Chron. ser. 3, **62,** 126 (1917) ; Mitt. Deutsch. Dendr. Ges. **28,** 124 (1919) ; Record, Timb. Trop. Amer. 432 (1924) ; Gilg in Engler u. Prantl, Natürl. Pflanzenfam. ed. 2, **21,** 49 (1925) ; Gard. Chron. ser. 3, **82,** 130 (1927) ; Winkler in Beitr. Biol. Pfl. **24,** 196–8 (1936). —*Pellinia cordifolia* Molina, Sagg. Chil. ed. 2, 290 (1810) (*nom. abortiv.*) ; Philippi in Bot. Zeit. **22,** Beih. 21 (1864).—*Pellinia chilensis* Molina, Sagg. Chil. ed. 2, 160 (1810) (*nom. abortiv.*) : Philippi in Bot. Zeitung, **22,** Beih., 12 (1864).—" *Eucryphia cordata* Cav.", Loudon, Encycl. Pl. **2,** 1394 (1855).

Molina (l.c.), without any reason, rejects the name *Eucryphia cordifolia* Cav., and creates the generic name *Pellinia* for *Eucryphia*. In his Italian description he then uses the specific epithet *chilensis* (p. 160), whilst in his system in the Polyandria Polygynia (p. 290) he makes the combination *Pellinia cordifolia*. The generic name *Pellinia* is of course superfluous (*nomen abortivum*).

Vernacular names : " roble de Chile," " roble de Chiloë," " ulmo " (Chile) ; " muermo " (Chilotes) ; " nçulnço," " ngulngo," " gnulgnu " (Mapuche Indians).—" Ulmo " and " muermo " are both said to be corruptions from the Spanish for the Indian name " ngulngo."

Type : San Carlos de Chiloë, *Cavanilles* (not seen !, probably in Herb. Matrit.).

Evergreen tree, up to 40 m. high, trunk upright and 30–60 cm. in diameter, branches copious in upper part. Older *branches* with a brownish bark, young branches tomentose when young, at length glabrescent. *Stipules* interpetiolar, linear, acute, very pubescent, brown, 3–9 mm. long. *Leaves* simple, opposite, broadly oblong, elliptic- or ovate-oblong ; obtuse or sometimes acute and slightly mucronate at the apex, cordate, truncate or rotundate at the base, repand-crenulate to serrate-dentate at the margins (the latter often in young seedlings, especially the top leaves), 3–7·1 cm. long (in cultivated specimens up to 13·2 cm.), 1·9–4·4 cm. broad, coriaceous, on the upper surface in the juvenile stage very pubescent, shining and dark green, mature leaves quite glabrous, network of veins close and conspicuous, on the under surface greyish or glaucescent, and softly pubescent especially on the midrib and on the lateral nerves, 7–11 pairs of lateral nerves ; petioles reddish-brown tomentose, 3·5–8 mm. long. *Flowers* solitary, axillary, from perulate, ovate-rotundate, tomentose buds ; peduncle not visible, pedicel tomentose, 0·9–2·1 cm. long. *Bracts* 6, at the base of the pedicel,

verticillate, ovate, rounded at the apex, pubescent, rigid, brown, persistent, the outer pair the shortest, 3·5–4 mm. long and 3–3·5 mm. broad. *Sepals* 4, rarely 5, broadly oblong, brown and tomentellous especially at the apex. *Petals* 4, rarely 5, obovate-rotundate to rotundate, slightly crenulate at the apex, scarious, white, up to 2·5 cm. long and broad. *Stamens* very numerous, many-seriate, filaments filiform, glabrous, up to 1·1 cm. long, surrounded at the base by shortly tubular, ciliate effigurations of the thalamus, anthers short and versatile. *Ovary* ovoid, glabrous, 9–13-locular, 9–13-sulcate or not furrowed, up to 5 mm. long and 2–3 mm. in diameter. *Styles* 9–13, glabrous, about 3·5 mm. long, stigmas minute. *Capsule* ligneous, oblong-clavate, up to 1·8 cm. long and 9 mm. in diameter, 9–13-sulcate or not furrowed (the latter in *Hollermayer* 1853), septicidally 9–13-valved, valves brownish-purple and glabrous on the back, brown and glabrous at the sides, on the apex of each valve a small persistent portion of the style; epicarp of the valve in mature fruits splitting off from the endocarp, sometimes with the exception of the very apex. *Fertile seeds* 2–3 in each valve; seeds ovate, winged, shining, glabrous and dark brown, up to 8 mm. long.

Cavanilles, l.c., gives 5 as the number of the petals and the sepals, and indeed very occasionally such a supernumerary petal or sepal occurs; as I have not seen the type, it is not possible to confirm or to contradict the original description on this point, but in my opinion the exceptional occurrence of such supernumerary petals and sepals (which I have seen only on cultivated material) should not be included in the normal complement. Wrongly the genera *Eucryphia* and *Carpodontos* have been kept separate only for the reason that the former genus sometimes exhibited the abnormality more than the latter (see *E. lucida* (Labill.) Baill., *Gunn* 272 !).

Flowers: January, February.

Distribution: Middle and Southern Chile (37°–44° S. lat.).

Prov. Arauco (Concepcion): Coronel, 1860, *C. Ockenius* s.n. (B.); Arauco Bay, south, no date, *Miss A. Calvert* s.n. (Br.M.); Colico, near Arauco Bay, no date, *Miss A. Calvert* s.n. (Br.M.); Carmino de los Rios, near Arauco, on the way to Hualqui, no date, *Philippi* s.n. (K.); Concepcion, 1825, *D'Urville* s.n. (B.). Prov. Bio Bio: Angol, Nov. 1896, *Dusén* 327 (M., St.). Prov. Cautin: Llollii de Chile, in open part of forest near stream, 300 m., Feb. 1926, *Comber* 558 (K.); Temuco, in forest, Jan. 1906, *Sargent* s.n. (K.); ibid., wooded hills near Niçlol, Feb. 1906, *Morton-Middleton* s.n. (Br. M., St.); ibid., Jan. 1920, *Cl. Joseph* 1058 (Wh.); Puerto Saavedra, hills with remains of former forest, 50 m., Feb. 1918 (fruits) and Nov. 1919 (flowers), *Hollermayer* 56 (B., M.); Budi, Jan. 1923, *Cl. Joseph* 1851 (Wh.). Prov. Valdivia: Panguipulli, 200 m., Feb. 1925, *Hollermayer* 362 (B., Br.M., M., N.Y., St., Wh.); ibid., 200 m., Nov. 1927, *Hollermeyer* 1853 (B., St., Wh.); ibid., Jan. 1920,

Cl. Joseph 2620 (Wh.) ; Corral, Feb. 1872, *Philippi* s.n. (B., Br.M., C.) ; ibid., Feb. 1930, *Gunckel* 52 (Br. M.) ; Arique River, Dec. 1850, *Lechler* 465 (Br.M., C., St., U.) ; ibid., in forests, no date, *Lechler* s.n. (B., M.). Without exact locality : in woods, 1833, *Bridges* 787 (B., Br.M., C., K., O.) ; no date, *Bridges* s.n. (K.) ; 1824–34, *Cl. Gay* 1250 (N.Y., Wh.) ; no date, *Philippi* s.n. (K.) ; 1861, *Philippi* s.n. (K.) ; Feb. 1885, *Philippi et Borchers* s.n. (Br.M.) ; in forests, 1896, *Buchtien* s.n. (Wh.) ; in forests, Feb. 1899, *Buchtien* s.n. (C., L., O.) ; Feb. 1925, *Cl. Joseph* 3274 (Wh.). Prov. Llanquihue : Lake Todos Santos, forest, Feb. 1902, *Elwes* s.n. (K.) ; Lake Llanquihue, Feb. 1902, *Elwes* s.n. (K.) ; Ensenada, near Lake Llanquihue, April 1897, *Dusén* s.n. (B.) ; Puerto Varas, Feb. 1927, *Gunther* s.n. (St.) ; Peulla, forest, 170–200 m., Feb. 1925, *Pennell* 12671 (N.Y., Wh.). Prov. Chiloë : Ancud, April 1868, *Cunningham* s.n. (K., N.Y.) ; ibid., in forest, 200 m., Feb. 1925, *Pennell* 12555 (N.Y.) ; ibid., Jan. 1932, *Macmillan et Erlanson* 1 (St., Wh.) ; San Carlos de Chiloë, no date, *Matthews* s.n. (L.) ; ibid., no date, no collector (B.).

Without exact locality : 1826–30, *Capt. King* s.n. (Br.M., C., K., O.) ; 1833, *Bridges* 787 (B., Br.M., C., K., O.) ; 1845, *Dr. Jos. Hooker* s.n. (K.) ; Feb. 1885, *Philippi et Borchers* s.n. (Br.M.) ; no date, *W. Lobb* s.n. (K.).

Without any locality : March 1852, *Philippi* 148 (B., Br.M., St.) ; 1803, *Cavanilles* s.n. (L.S.) ; 1860, *H. Krause* s.n. (B.) ; 1904, *Philippi* s.n. (Br.M.) ; no date, *Philippi* s.n. (B., K., Wh.) ; no date, *Cl. Gay* s.n. (B., K., N.Y., O., P.).

Cultivated : Hort. Bot. Reg. Kew., from Ward's Case, Aug. 1877 (K.).

Lucien Hauman in " La forêt valdivienne et ses limites " (Rec. Inst. Bot. Bruxelles **9**) studied the zone between 40° and 41° S. lat. (between Valdivia and Puerto Montt). He gives the following information : " The characteristic element of the Valdivian forest is *Eucryphia cordifolia*. Everywhere, where the forest occurs in all its complexity, one can find it always. But, on the contrary, it is the first to disappear, whenever the climatic conditions modify in a sensible way ; the forest becomes poorer, and with the exception of the frontier zones where it does not occur, the geographical area of *E. cordifolia* coincides exactly with the formation of the Valdivian forest. Only in the northern part of the Valdivian forest *E. glandulosa* is to be found. At the boundary of the formation, some miles east of Lake Todos los Santos, in the higher region, *i.e.*, higher than 500 m., the *E. cordifolia* and *Nothofagus Dombeyi* formation disappears first, later the *Bambusa*, *Flotowia* and *Weinmannia*, and is replaced by *Nothofagus pumilio*. The extreme altitude of that boundary is about 1000 m., and on the other side of the mountain *Eucryphia* does not appear again. The absence of *Eucryphia* there is an important fact, which is completely explained by the difference in altitude ; one can see it disappear at 500 m. altitude round

Lake Todos los Santos, and so it is impossible to find it again at 740 m. (Nahuel Huapi) at the other side of the Andes."

Carl Skottsberg, in his "Vegetationsverhältnisse längs der Cordillera de los Andes" (K. Svensk. Vet. Akad. Handlingar, n.s. **56,** no. 5, 1916), gives some more localities and typical associations in which this species occurs. "A characteristic element of the Valdivian rain-forest; in Chile from the province Arauco to N. West Patagonia, 43° 40′ S. In Chiloë abundant in the coast-districts, near Ancud together with *Aextoxicum punctatum, Drimys Winteri, Guevina avellana, Laurelia serrata*, etc. In the interior of Chiloe in the forests round the Rio Pudeto (Fundo San Antonio) the species is dominant and forms the *Eucryphia-Myrceugenia*-association. *Eucryphia cordifolia* and *Nothofagus Dombeyi* reach a height of 50 m. in this region; towards the mouth of the Rio Pudeto, in forests and on sandbanks, the *Aextoxicum*-association becomes dominant and *Eucryphia cordifolia* grows as solitary trees." Further, Skottsberg found the species in the province of Llanquihue near Peulla, Lago Todos los Santos, and in Cerro Tronador (3400 m.) also as a part of the glacier vegetation. In this last vegetation the plants were of dwarf-shrubby character.

With the cultivated specimen indicated on the sheet by: "From a wardian-case from Chile," the description of *Eucryphia patagonica* Speg. (Spegazzini in An. Mus. Nac. Buenos Aires, **7,** 281, no. 920, 1902) agrees very well, with the exception of the stipules. *Eucryphia cordifolia* Cav. has very linear, acute, pubescent stipules up to 9 mm. long; according to Spegazzini's description *E. patagonica* has very short, obtuse, pubescent ones. The cultivated specimen in question has been attributed by Dr. J. Hutchinson of Kew to *E. patagonica* Speg. with the following note on the sheet: "but evidently only a seedling of *E. cordifolia* Cav." It has indeed the same linear, acute stipules as the latter, up to 4 mm. long, although they are hardly pubescent. Notwithstanding the glabrous stipules, the very serrate-dentate, acute and subsessile or very shortly petioled leaves, it was right to attribute the specimen to *E. cordifolia* Cav.; in juvenile stages plants often show great differences from the mature ones. It is not advisable however to refer this specimen to *E. patagonica* Speg., as the type specimen of the latter, according to a letter from Prof. Dr. L. Parodi from Buenos Aires (November 1936), has disappeared in some way and a topotype could not be found by him at the type locality in the woods round Puerto Nuevo, Lake Nahuel-Huapi. Mr. H. F. Comber, who visited these regions twice, informed me that he believed in the possibility of another species being found, as the 4000 ft. level of the Andes in that region is most inaccessible; this area may contain many little known plants. Until more evidence is available, *E. patagonica* Speg. should be regarded as a doubtful species, the description of which follows here.

E. patagonica *Speg.* in Anal. Mus. Nac. de Buenos Aires, **7,** 281, nr. 920 (1902).

Type : Round Puerto Nuevo, Lago Nahuelhuapi, Dec. 1897, *C. Spegazzini* (in herb. Mus. Buenos Aires ?, not seen).

Arborea, ramis fastigiatis, ramulis dense hispido-villosis, foliis simplicibus decussatis brevissime petiolatis elongato-lanceolatis basi obtuse rotundatis non v. vix cordatis apice sensim attenuatis acutis margine irregulariter serratis, dentibus acutis cuspidato-mucronatis, pergameneo-subcoriaceis superne glabris subnitidis, inferne cinerascentibus ad nervos praecipue villosis, floribus solitariis longe pedunculatis, sepalis pubescentibus, staminibus numerosis glabris.

The following description has been translated from the Latin one of Spegazzini :

Species very closely related to *E. cordifolia* Cav., but differing in the longer, more shortly petioled, acute leaves with acute-mucronate marginal teeth. *Tree* more than 10 m. in height, trunk robust, cortex ochraceous, almost smooth ; branches not very divaricate, branchlets rather dense. *Branchlets* subvirgate, obsoletely and alternately subcompressed, densely and patently ferrugineo-villose, internodes varying greatly in length, 1–3·5 cm. long and 2·5–3 mm. in diam. *Stipules* short, obtuse, ferrugineo-villose, interpetiolar and very deciduous. Petioles very short (2–3 mm. long), densely long ferrugineo-villose. *Leaves* decussate, very spreading, lamina pergameneous, lanceolate, 5–15 cm. long and 1·5–4 cm. broad ; obtusely rotundate, not or scarcely subcordate at the base, gradually cuneate-attenuate, acute and often mucronate at the apex ; margins dentate-serrate with 15–35 teeth on either side, teeth slightly irregular acute-mucronate, on the upper surface dark somewhat glossy green, densely and minutely reticulate, in juvenile stage puberulous hispidulous, in mature stage entirely glabrate, or the midrib villosulous ; on the under surface cinereous or glaucous, densely and prominently nerved, about 15–35 pairs of secondary nerves from the midrib, densely or loosely and patulously ferrugineo-villose. *Flowers* solitary, axillary, collected towards the end of the branches ; peduncles scarcely half as long as the leaves, 1–3 cm. long and 0·1 cm. in diam., base perulate, ferrugineo-villose ; sepals puberulous, stamens numerous, filaments glabrous.

Genus to be excluded.

Paracryphia *Baker fil.* in Journ. Linn. Soc. **46,** 306 (1921) ; Gilg in Engler u. Prantl, Natürl. Pflanzenfam. ed. 2, **21,** 50 (1925).

Perianth segments 2, imbricate, hirsute on the outside, subcalyptrate, very caducous. *Stamens* 8–10, subperigynous, anthers basifixed, dehiscent longitudinally, yellowish, filaments enlarged after flowering time. *Ovary* free, hirsute, 12–15-locular, multiovulate ;

in each loculus few ovules, attached uniseriately to the central axis. *Capsule* septicidally dehiscent into 12–15 valves, which separate from the placenta-bearing axis with the exception of the very apex ; each valve few-seeded. *Shrub* or *small tree,* up to 20 ft. in height. *Leaves* simple, nearly glabrous, verticillate or subverticillate, coriaceous, serrate at the margins, base attenuate into the petiole, apex subacuminate. *Flowers* small, in panicles, upper ones hermaphrodite, lower ones male.

Species 1, *P. suaveolens* Bak. f. loc. cit.

Shrub or *small tree,* 6–7 m. in height, branchlets with a cinereous cortex. *Leaves* oblanceolate to oblong-lanceolate, 5–11 cm. long and 1·2–3 cm. broad, margins serrate, coriaceous, subacuminate at the apex, glabrous on the upper surface, on the under surface midrib conspicuous, lateral nerves slender ; petiole thick, 1–2 cm. long. *Perianth segments* concave, very caducous, ferrugineo-hirsute on the outside. *Stamens* 8–10, anthers 3–4 mm. long and longitudinally dehiscent, filaments enlarged after flowering time ; ovary 12–15-locular. *Capsule* septicidally dehiscent into few-seeded valves, which are 7–8 mm. long and 1–1·5 mm. broad.

Distribution : New Caledonia : Ignambi, forest, 1000–1650 m., *Compton* 1515 (type !, Br. M.) ; Mt. Panié, forest, 500 m., *Compton* 1772 (Br.M.).

This genus differs from *Eucryphia* in the subcalyptrate, caducous perianth segments, character of inflorescence, sessile stigmas, small number of stamens, absence of the shortly tubular effigurations of the thalamus, verticillate leaves, uniseriate ovules, etc. ; only the dehiscence of the fruit would suggest relationship to *Eucryphia,* if the attachment of the persistent valves to the central axis were not so different. The valves of the mature fruit in this genus are attached at their very apex to the central axis by means of one very short filament, which is placed on the top of the central axis ; in the genus *Eucryphia* the two filaments, bearing the valves, are attached at or nearly at the base of the valves, running up towards the apex. Here the filaments split off from the central axis for their total length, remaining attached by their base to the base of the central axis. This peculiar opening of the capsule can also be found in other families. For the reasons mentioned above, it does not seem desirable to place *Paracryphia* in the family *Eucryphiaceae.* Possible allies could be the *Winteraceae* (*Drimys, Illicium*) and *Trochodendraceae.* In the *Winteraceae* the peculiar enlargement of the filaments of the stamens is found also. In *Paracryphia* this enlargement is probably not, as Mr. E. G. Baker writes, due to a gall ; it only occurs in the male flowers : in the hermaphrodite flowers the filaments retain their original size after flowering time.

V. History of the Genus and the Family.

In 1797 the genus *Eucryphia* was created by Cavanilles with *E. cordifolia* as type-species, a plant he had found on one of his

many travels to the southwestern part of Chile ; he was not sure, however, in which family this remarkable genus should be placed. Persoon (1807) was also unable to decide ; Molina (1810) in his system in " Saggio de Chile " (ed. 2) placed it in the class *Polyandria Polygynia* under the generic name *Pellinia*.* After that period nearly every botanist, who mentioned the genus, had a different opinion on its systematic position : Sprengel (1818) was the first to point out its relationship to the *Rosaceae* ; Choisy (1821) believed it to be an anomalous genus in the *Hypericaceae* ; Cambessèdes (1830) proposed to form a section ' *Eucryphieae* ' in the *Hypericineae*, consisting of the three genera *Eucryphia, Carpodontos* and *Eliea*. This section was meant to form a connexion between the *Hypericineae* and the *Ternstroemiaceae*, whilst the genus *Haronga* of the *Hypericineae* formed a connexion to the *Guttiferae* ; this opinion is generally accepted nowadays by including the *Hypericaceae* in the *Guttiferae*. The genus *Eliea*, which seemed to be related to *Eucryphia*, and dried specimens of which have been attributed to the latter, has been placed by Engler in the tribe *Hypericoideae-Cratoxyleae*. Spach (1836) pointed out the relationship of *Eucryphia* to the *Ternstroemiaceae*, particularly to *Laplacea* ; at the same time he included the genus *Carpodontos*, with the only species known at that time, *C. lucida* Labill., in the genus *Eucryphia*. *Carpodontos* had been created in 1798 by Labillardière. It is evident now that *Carpodontos* is merely the same genus as *Eucryphia*, but botanists such as G. Don, Sprengel, Reichenbach, Choisy, Endlicher and others, kept these two genera separate. Endlicher (1839 and 1841) placed the section *Eucryphieae* (genera *Eucryphia* and *Carpodontos*) in the *Chlaenaceae*, mainly because it had albuminous seeds as in the *Chlaenaceae* and *Ternstroemiaceae* ; although, in his opinion, the opposite leaves pointed strongly to the *Hypericineae*. Schnizlein (1843–70) suggests a relationship near the *Rutaceae*, though he gives no reasons. Agardh, in the " Theoria," does not cite the genus at all. Lindley (1847) also favours the *Hypericineae*, especially because of the oblique and unequal-sided petals. The first to constitute a new order ' Eucryphiaceas ' (or family *Eucryphiaceae*) was Claude Gay (1854) : following Endlicher, he placed this new order near the *Chlaenaceae* and the *Hypericineae*, with a strong emphasis towards the latter. Planchon (1854) places the genus in the *Cunoniaceae*, a ' subseries ' of the *Saxifragaceae*,

* Dr. R. A. Philippi in " Commentar zu den von Molina beschriebenen Chilenischen Pflanzen " (Bot. Zeitung, Beih. 1864) attributed Molina's mistake to the following confusion : Molina confused the ' Coyam ' of the Indians (' Roble ' of the Spaniards, *Fagus obliqua* Mirb.), with the ' Muermo ' or ' Ulmo ' (*Eucryphia cordifolia* Cav.). Although Molina knew the araucanian language very well, he was unaware that the word ' Pellin ' did not mean a particular tree, but only heartwood in general. In a special note he adds that on the branches of the tree is to be found a soft excrescence of a white colour, called ' Dihuen,' with red perforations containing a very sweet liquid and very much appreciated by the people. It is a fungus : *Cyttaria Berterii* Berk.

notwithstanding the hypogynous stamens and the very much imbricated sepals and petals; resemblances in the vegetative characters in his opinion pointed to *Weinmannia*, the stamens to *Belangera*, and the capsules and their dehiscence were similar to those of the *Cunoniaceae*. Bentham and Hooker (1862) and Hooker (1889) followed Sprengel in placing *Eucryphia* in the *Rosaceae*, in the tribe *Quillajeae*. Bentham (1864) cited *Eucryphia* as the 16th genus of the *Saxifragaceae-Cunoniaceae*, thus following Planchon. In Bentham's opinion differences in foliage, the presence of the connate stipules and the albuminous seeds removed *Eucryphia* too much from the *Hypericaceae*; the fruits and the seeds were nearly those of *Geissois* (15th genus in his *Saxifragaceae-Cunoniaceae*), except that the carpels were more numerous. Baillon (1867–69) followed Bentham and Hooker in including *Eucryphia* as an anomalous type in the tribe *Quillajeae* of the *Rosaceae*. Maximowicz (1879) in his "Adnotationes de Spiraeaceis" allies the genus to the *Tiliaceae*, pointing especially to the *Sloaneeae* and *Elaeocarpeae*. Focke (1893) in Engler and Prantl's "Die Natürlichen Pflanzenfamilien" restored Gay's view in regarding the *Eucryphiaceae* as a distinct family, allied, however, to the *Ternstroemiaceae* and the other members of Engler's subseries *Theineae*; he accordingly placed the family between the *Dilleniaceae* and the *Ochnaceae*.

In 1901 in his "Abhandlung über Tubifloren und Ebenalen" and in 1903 in Engler's "Rosalen" Hans Hallier brought *Eucryphia* in relation to the *Cunoniaceae* again; in the latter work also to the *Quiinaceae*, *Rosaceae* and, by mistake, also to the genus *Brunellia* of the *Terebinthaceae*. *Eucryphia*, the *Cunoniaceae*, *Quiinaceae* and *Brunellia* form together a tribe in his *Rosaceae*. Rodway (1903) placed *Eucryphia* in the *Saxifragaceae* near the genus *Tetracarpaea*; he stated that *Eucryphia* was, like *Tetracarpaea*, not typically saxifragaceous, but more allied to that order than to any other. Hallier (1908) in "Über Juliania und die wahren Stammeltern der Kätzchenblüher" recognized his mistake in having formed the *Rosaceae*-tribe mentioned above. He now regarded the *Quiinaceae*, notwithstanding the relationship to the *Saxifragaceae*, as more nearly related to the *Ochnaceae* and the *Guttiferae* than to the *Cunoniaceae* incl. *Eucryphia*. In the first part of that work Hallier made it clear why the *Cunoniaceae* should be treated as a separate family next to the *Saxifragaceae*, a treatment which, in the author's opinion, is undoubtedly right. It seems advisable to mention the most important reason which Hallier has given, in connexion with the systematic position which the writer thinks should be assigned to the *Eucryphiaceae*. The *Cunoniaceae* are distinguished from all the *Saxifragaceae* except the *Brexieae* by a superficial cork-development. Although the *Cunoniaceae* have opposite leaves, they evidently must not be placed near the *Philadelpheae*, but, in view of the superficial development of the cork and the coriaceous-pergamentaceous leaves, to

the *Brexieae*. Stipules similar to those of the *Cunoniaceae* also occur in the *Brexieae*-genera *Strasburgera* and *Itea*. In many respects, in his opinion, the *Cunoniaceae* might be placed near the following families, which are nearly related to the *Brexieae*, viz., *Ternstroemiaceae*, *Quiinaceae* and *Guttiferae*, especially if *Eucryphia* is included in the *Cunoniaceae* as an older type, in which the gynaeceum is still polymerous, and possesses an elongated floral axis. Some of the points, on the basis of which he included *Eucryphia* in the *Cunoniaceae*, are the following: (1) The gelatinization of the inner walls of the epidermal cells of the leaves, characteristic of the *Cunoniaceae* (also *Bergia*), is also to be found in *Eucryphia* (according to Radlkofer, Küster and Kruch in Solereder's "Systematische Anatomie der Dikotyledonen," Germ. ed.). (2) The vessels are small in diameter, and the elements of which they are composed scalariform with many bars, or simple. (3) The phloem strands are separated from one another by sclerenchyma, and the epidermal hairs are unicellular as in the *Cunoniaceae*. (4) Spicular cells, similar to those in *Pancheria*, are present in the parenchyma. (5) The stipules and bracts possess digitiform resin-secreting glands which may correspond to the glandular hairs of *Escallonia*, *Cunonia* and *Ceratopetalum*. (6) The distribution of *Eucryphia* (Chile, Tasmania, New South Wales and Victoria) is similar to that of the *Cunoniaceae*. (7) The very prominent reticulation of the upper surface of the leaves of *E. cordifolia* Cav. is very similar to that of *Callicoma serratifolia* Andr., *Ceratopetalum gummiferum* Sm., and *Platylophos trifoliatus* D. Don, and hairs are more abundant on the lower than on the upper surface. (8) The sepals of the same species of *Eucryphia* bear many parallel veins on the inner side as in *Ceratopetalum*, and are caducous as in *Gillbeea* and *Belangera*. (9) By the extraordinary "red"* petals *Eucryphia* approaches *Bauera*, by the form and number of the stamens to *Bauera* and *Belangera*, by the septicidal capsule to *Cunonia*, *Weinmannia*, *Belangera*, *Philadelphus*, *Itea* and *Escallonia*. Further he stated that *Medusagyne oppositifolia* Bak. of the Seychelles should be regarded as very closely allied to *Eucryphia*.

Engler and Gilg (1912) placed the *Eucryphiaceae* again between the *Dilleniaceae* and the *Ochnaceae*, in the immediate neighbourhood of the *Theaceae* and the *Guttiferae*. In 1921 Hallier in the "Beiträge zur Kenntnis der Linaceae" (Bot. Centralbl. Beih. **39,** pt. 2, 160) proposed quite another theory. He formed a polymorphic centre of development, the *Linaceae*, from which the higher Dicotyledons had developed along several different lines. The *Quiinaceae* (with "*Linaceae*-venation" in the leaves and the "*Bonnetieae*-anthers"), *Eucryphia* (with the gelatinized inner walls of the epidermal leaf-

*Hallier made a curious mistake by stating "red" petals, as all the *Eucryphias*, known up till now, have white petals. Probably Hallier saw only dried material; in the dried state the white colour of the petals turns into an orange-red colour, and so may cause confusion.

cells and reticulation of the leaves, "*Bonnetieae*-anthers," the boat-shaped valves of the capsules as in the *Bonnetieae* and the *Ixonantheae*, and the epitropous, winged seeds as in *Emmenanthus*) and *Medusagyne* should belong to the *Linaceae*. They could be derived from this centre, more or less in the same way as they were derived by Hallier himself in 1908, from the *Saxifragaceae-Brexieae*. Wettstein (1923) placed the *Eucryphiaceae* in the order *Guttiferales* after the *Dilleniaceae* and the *Ochnaceae*. From these latter families the *Eucryphiaceae* were very different in the tetramerous petals and sepals and in the separating valves of the capsule. Gilg and Melchior (1925) placed the family together with the *Medusagynaceae* between the *Actinidiaceae* and the *Ochnaceae* in the *Parietales*. Sandwith (1935) added an interesting note to his description of *E. Moorei* F.v.M. in Curtis' Botanical Magazine: "The high position of the bracts [in this species], normally above the middle, on the mature flower stalk, is a peculiar character which appears to separate it from all its congeners, in which the bracts arise from near the base. Perhaps this character, suggesting a more elaborate inflorescence with a longer common peduncle, combines with that of the numerous leaflets of the compound leaves to indicate that *E. Moorei* is the youngest of the species of *Eucryphia* in existence to-day; but any such theory would stand or fall by the taxonomic position which is finally given to this much discussed family."— The possibility of the direction of the lines of evolution being just the other way round (compound leaves → simple leaves, elaborate inflorescence → simple inflorescence) is not mentioned, but, however that may be, an attempt will be made to show, that, whether more primitive or not, the *Eucryphiaceae* are undoubtedly closely related to the *Saxifragaceae-Cunoniaceae*. The *Eucryphiaceae* certainly offer many characters in common with many of the families and genera mentioned above besides the *Cunoniaceae*, but the balance of characters is evidently in favour of this last family. Whether the *Medusagynaceae* should be placed next to the *Eucryphiaceae*, is a very difficult question to answer, as the dried material is not abundant and wood for anatomical investigation could not be obtained. Some of the characters are in favour of the *Eucryphiaceae*, e.g., the calyptrately caducous sepals, the numerous stamens which remain much longer than the petals and sepals, the polymerous ovary and the winged seeds. Other characters however offer great differences, e.g., the red petals, the angular ovary, the unguiculate short pedicel of the fruit, the valves of the mature fruit separating from the central axis in the same way as in *Paracryphia suaveolens* Bak.f., the funicles being on the top of the central axis and the styles being placed at an appreciable distance from each other on the ovary; further, the geographical distribution and anatomical characters of this genus are of a different type from that of the *Eucryphiaceae*.

VI. Anatomical Structure of the Wood.

The wood structure of the various species of *Eucryphia* available for study is very uniform, and the following description might equally well be applied to any of them.

Macroscopic Characters. *Colour* similar to the "fawn" on plate 40 of Ridgway's "Colour Standards and Nomenclature." Sap- and heartwood not sharply differentiated; odour and taste absent or not distinctive. *Specific gravity* (air dry) 0·63–0·65. *Grain* straight or nearly so; texture fine and uniform (suggesting according to Professor Record the "red gum" *Liquidambar*). *Growth rings* not obvious under the hand lens, but conspicuous under the microscope (see below). *Pores* not visible to the naked eye, but just visible with the hand lens; solitary or in multiples, vessel-lines fairly obvious with a hand lens. *Parenchyma* not visible without the microscope. *Rays* crowded, clearly visible with a hand lens on transverse and radial surfaces, appearing more reddish in colour than the surrounding tissues.

Microscopic Characters. *Vessels*: Internal diameter of the solitary vessels 31–77 (mostly about 60)μ, about 72–113 vessels or vessel-multiples per sq. mm.; solitary or in multiples, the latter in radial pairs or short chains; tangential oblique pairs also present. *Growth rings* conspicuous, marked by narrow concentric bands of small vessels alternating with larger ones. Concentric zones of terminal parenchyma sometimes present. All elements in this position tending to be radially flattened. A fair proportion of the vessels contiguous to the rays. Average length of vessel-elements (after maceration with potassium chlorate and 10 per cent. nitric acid) 341–1085 (mostly 700–775)μ. Vessel elements with or without tails, the latter sometimes of considerable length. Intervascular pits small, bordered, with horizontal apertures, or with scalariform and intermediate types of pitting. Perforations both simple and scalariform, the latter with 5–39 bars. Vessel-ray pits not easily seen in most instances owing to deposits in the ray cells; approximately circular to horizontally elongated, the borders of the larger pits being inconspicuous, those of the smaller ones more obvious. Thin-walled tyloses rarely present. *Fibres*. Groundwork of wood composed of thick-walled fibre-tracheids with small, slit-shaped, usually vertically orientated pits with inconspicuous borders, or small circular pits with conspicuous borders; apertures sometimes extending beyond the borders; not arranged in radial rows, 310–1360μ long and 14–20μ in diameter; angular in transverse section, usually hexagonal, lumen circular or oval. *Parenchyma*. Chiefly diffuse, more abundant in the neighbourhood of the smaller than of the larger vessels; consisting of isolated cells or cells in short, usually tangential groups, rarely in small blocks. Terminal parenchyma sometimes present as well, and also a small amount of paratracheal parenchyma. *Rays*. 10–12 per m.m. in transverse sections, predominently biseriate, but sometimes with uniseriate

margins, occasionally confluent. Short uniseriate rays also present. Rays 1–22 (mostly 9–13) cells high, heterogeneous, central cells procumbent, marginal cells upright. Height of rays about 200–375 (maximum 558)μ; most of the cells filled with dense granular contents. *Gum Ducts and Ripple Marks*: absent. *Pith*: small, some of the cells filled with densely staining contents. *Leaves*: bifacial with beams of sclerenchyma. Hairs on leaves short, thick-walled and always unicellular.

There were found to be slight differences in the length, diameter and distribution of the vessels, and in the length of the fibre-tracheids of the four species of *Eucryphia* examined. These are not recorded, however, as they were not sufficiently great to enable the species to be identified with certainty. The colour of the wood of the four species also varied somewhat, but it is not known whether these differences are sufficiently constant to be of diagnostic value.

Material Examined :—*Eucryphia cordifolia* Cav. : Yale 3749 and 4932. *E. lucida* (Labill) Baill. : Yale 19658 and 19951. *E. Moorei* F.v.M. : Yale 19336. Kew 24–1890. *E. glutinosa* (Poepp. et Endl.) Baill. : Ex Hort. Bot. Reg. Kew.

The anatomical structure of the wood has been carefully compared with that of a few members of the different families in which the genus has been placed or to which it has been said to be related, but especially with the *Cunoniaceae*. Wood specimens from the museums or from plants cultivated in the gardens at Kew were used for this purpose. The following is a list of species with which comparison were made :—

Cunoniaceae :—*Weinmannia trichosperma* Cav., *W. sylvicola* Br., *W. racemosa* L.f., *Geissois Benthami* F.v.M., *Cunonia capensis* L., *Platylophos trifoliatus* D. Don, *Acrophyllum verticillatum* (D. Don) Hook. fil., *Ceratopetalum apetalum* D. Don.

Combretaceae :—*Terminalia Catappa* L., *Combretum holosericeum* Sond.

Elaeocarpaceae :—*Elaeocarpus Hullettii* King, *E. grandis* F.v.M., *E. dentatus* Vahl, *Sloanea javanica* Ridley, *S. Sigun* K. Schum.

Dilleniaceae :—*Dillenia pulcherrima* Kurz, *D. parviflora* Griff.

Theaceae :—*Camellia japonica* L., *C. Sasanqua* Thunb., *C. drupifera* Lour.

Hypericaceae :—*Hypericum lanceolatum* Lamk., *H. Leschenaultii* Choisy.

Rosaceae :—*Prunus avium* L., *P. serotina* Ehrh., *Quillaja saponaria* Mol., *Lyonothamnus floribundus* A. Gray, *Rhodotypos kerrioides* Sieb. et Zucc.

Tiliaceae :—*Tilia americana* L.

Ochnaceae :—*Ochna arborea* Burch.

Guttiferae :—*Symphonia globulifera* L.f., *Clusia alba* Jacq., *Cratoxylon polyanthum* Korth.

Dipterocarpaceae :—*Dipterocarpus alatus* Roxb.

	A.	B.	C.	D.	E.	F.	G.	H.	K.	L.	M.	N.	O.
Elaeocarpaceae ...	p.	—	—	p.	—	—	p.	—	—	—	p.	—	—
Dilleniaceae ...	—	p.	—	—	p.	p.	—	p.	—	—	—	—	p.
Hypericaceae ...	—	—	—	—	p.	—	p.	—	—	—	—	—	—
Theaceae ...	p.	—	—	—	—	p.	—	p.	—	—	p.	—	p.
Cunoniaceae ...	(p)	—	—	—	—	—	—	p.	—	p.	—	—	p.
Rosaceae ...	p.	p.	—	—	—	—	p.	—	—	—	p.	p.	p.
Tiliaceae ...	p.	—	p.	—	—	—	p.	—	—	—	p.	—	—
Guttiferae ...	—	p.	—	p.	—	—	p.	—	—	—	—	—	—
Chlaenaceae ...	—	—	—	—	—	—	p.	—	—	—	—	—	—
Linaceae ...	—	—	—	—	—	—	p.	—	—	—	p.	—	—
Ochnaceae ...	—	—	—	—	—	—	p.	—	p.	—	—	—	p.
Brunelliaceae ...	—	—	—	—	—	—	p.	—	—	p.	—	—	—
Eucryphiaceae ...	—	—	—	—	—	—	—	p.	—	p.	—	—	p.
Dipterocarpaceae	—	—	p.	p.	—	—	p.	—	p.	—	—	—	—

Table I.

As the result of this comparative anatomical study of the timbers it was possible to construct Table I.

Explanation of Table I.

A = Ringporous wood. B = Conspicuous large rays. C = Ripple marks or storied structure. D = Intercellular canals (vertical-normal, vertical-gummosis or radial-small type). E = Included phloem. F = Raphides. G = Simple perforations in the vessels (with or without the tendency to multiple perforations). H = Scalariform perforation plates in the vessels (with or without the tendency to simple perforations). K = Vestured pits. L = Scalariform pitting. M = Spiral thickenings in the vessels. N = Spiral thickenings in the fibre-tracheids. O = Wood fibres with conspicuous bordered pits. p. = Present or usually so; — means absent.

The sign (p) in column A was inserted against the *Cunoniaceae* because only the single species *Platylophos trifoliatus* D. Don was found to have ring-porous wood. The writer, however, thinks it is doubtful whether the genus *Platylophos* is really a member of the *Cunoniaceae*. This suggestion is supported by the chemical evidence (see below).

The similarity of the wood structure of *Eucryphia* to that of the *Cunoniaceae* is very striking (see Table I). The most important

characters of the *Eucryphiaceae* are also to be found in the *Cunoniaceae* in the great majority of the cases investigated. *Platylophos* in the *Cunoniaceae*, as mentioned already, seems to be more typical of the *Saxifragaceae*. The vessel perforations throughout both the *Cunoniaceae* and *Eucryphiaceae* are predominently scalariform, but in both families simple perforations also occur although less frequently.

The *Cunoniaceae* also have scalariform pitting like the *Eucryphiaceae* and these two families seem to be the only ones amongst those investigated, which show these characters together. The fibre-tracheids in both families have conspicuous bordered pits, the crossed apertures extending beyond the borders. In the *Rosaceae*, *Dilleniaceae* and the *Theaceae* these apertures extend in a more V-like shape beyond the borders. The internal diameter of the vessel-elements of most of the *Cunoniaceae* is about the same size as that of the *Eucryphiaceae* : in the genus *Weinmannia* 27 to 77μ, in *Geissois* 46 to 94μ, and in *Cunonia* 30–62μ ; in the *Combretaceae*, *Terminalia Catappa* L. and *Combretum holosericeum* Sond., which also show some similarity in the wood structure, possess vessels with an internal transverse diameter of 66–201μ. *Sloanea* (*Elaeocarpaceae*) is distinguished from the *Eucryphiaceae* in wood structure by the vertical canals and exclusively simple perforations in the vessels ; *Elaeocarpus* has, besides the last character of the former family, also ring-porous wood and spiral thickenings in the vessels, whilst the canals are of the vertical-gummosis type. Although some characters of the *Dilleniaceae* are exhibited by the *Eucryphiaceae* and *Cunoniaceae* as well, the first of these families usually differs in having much broader rays, and included phloem has been recorded for one genus. The *Hypericaceae* differ in possessing included phloem (island-type) in some of the species and by having only simple perforations in the vessels. The *Theaceae* differ in having ring-porous wood, raphides and also spiral thickenings in the vessels. The *Rosaceae* often possess comparatively large rays, ring-porous woods in some species, simple vessel perforations with a tendency towards the multiple type, and spiral thickenings in vessels and fibre-tracheids ; the *Tiliaceae* show, besides some of the last-mentioned differences, also ripple marks. Some of the *Guttiferae* have small radial intercellular canals, large conspicuous rays and simple perforations to the vessels, whilst the *Chlaenaceae* possess very few of the characters mentioned above, being distinguished by having only simple perforations and no tendency to multiples. Also the *Linaceae* and the *Ochnaceae* both possess only simple vessel perforations, the latter also vestured pits. The *Brunelliaceae*, from which the genus *Brunellia* showed some similarities to *Eucryphia* according to Hallier, indeed show this in their wood structure by having both simple and scalariform vessel perforations. The *Dipterocarpaceae* are quite different in wood structure from the *Eucryphiaceae* as they have vertical intercellular

canals, vestured pits, only simple perforations to the vessels and sometimes ripple marks. From this it is clear that the greatest similarity in wood structure is shown between the *Cunoniaceae* and the *Eucryphiaceae*, and this, combined with the morphological, geographical and biochemical characters, which these two families have in common, undoubtedly indicates that the *Cunoniaceae* possess a greater balance of characters than all the other families to which *Eucryphia* has been attributed. The *Medusagynaceae* differ also in their wood structure from the *Eucryphiaceae*; this information has been obtained from Engler and Prantl, Nat. Pfl. Fam. **21**, p. 51/52. In the juvenile stage the medullary rays are 5–8 cells high, later never more than 2–3 cells; the average number of these in the *Eucryphiaceae* is between 10 and 15. The fibre-tracheids are extraordinarily narrow, and with very small lumina; the vessels are always with simple perforations. The quantity of wood parenchyma is much larger than in the *Eucryphiaceae* and between the ordinary parenchyma cells of the pith, many sclerenchyma cells are present. Vascular bundles are also present in the cortex; these are absent throughout the *Eucryphiaceae*. They differ from the *Marcgraviaceae* and *Guttiferae* by the absence of resin elements, from the *Theaceae* by the absence of the characteristic sclereids; with the *Ochnaceae* they agree partly in having cortical vascular bundles and also in the wood structure.

VII. Some chemical properties of the wood of three Eucryphia species compared with those of Cunonia capensis L. and Platylophos trifoliatus D. Don.

For help with this section, which is based on work carried out during the summer of 1937 in the Jodrell Laboratory of the Royal Botanic Gardens, Kew, the writer is very much indebted to Mr. J. Pryde, a visitor working there. Extracts of sawdust taken from the heartwoods of the undermentioned timbers were made, and the colours of the solutions were noted as following :—

Extracts made with :	*Cunonia* sp. :	*Platylophos* sp. :	*Eucryphia* spp. :
Boiling water ...	Red.	Yellow.	Reddish brown.
Absolute alcohol ...	Red.	Brown.	Red.
Dilute ammonia ...	Vinous red.	Yellow passing to pink.	Red passing to brown.

Table II.

It may be noted that all the aqueous extracts were acid to litmus. When the aqueous and alcoholic extracts were tested with an $FeCl_3$ solution, abundant dark blue precipitates were obtained with the *Cunonia* and *Eucryphia* spp., but not with *Platylophos*. Tannic acid is therefore present in the first two,

which was confirmed by other well known tests for tannin. The presence of phlobatannins in the same two woods was inferred from the reddish brown precipitates obtained on boiling aqueous extracts with a few drops of tincture of iodine. But there was a difference in the colours of the filtrates, that from *Cunonia* wood being yellowish brown, while the other was blue. The blue colour suggests starch, or a saponin in colloidal condition. As no starch was found in wood sections of *Eucryphia* examined under the microscope, it was inferred that the blue colour was probably due to a saponin.

Further evidence of the presence of a saponin was the distinct frothing observed on shaking an aqueous extract of *Eucryphia* sawdust. In this respect the *Eucryphia* resembles *Quillaja saponaria* Mol.

In the stem and in the leaves of the Eucryphias, as reactions with tincture of alkannin showed, there was no trace of resin. The tops of the connate stipules and the basal and pedunculate bracts however carry many digitiform glands, which excrete a yellow, waxy, aromatic resin in great quantities. This resin runs down the stem and branches and coagulates as a thick mass on the leaves. It looks almost as though the resin has been formed on the leaves themselves; for this reason Bentham and Hooker called them "arbores resinosae." The resin of *E. lucida* (Labill.) Baill. has highly antiseptic or styptic properties and therefore is greatly valued for cuts and bruises. The results of these investigations may be summarized as follows:—The chemical properties of the three species of *Eucryphia* investigated are fairly similar; the quantities of tannic extracts in the various species vary between 15 and 22 per cent.* *Cunonia capensis* L. showed great chemical similarity to *Eucryphia* in possessing about the same quantities of tannin, a little less phenolic substances, and phlobatannins. *Platylophos trifoliatus* D. Don in these respects, however, appeared to be quite different from the two former genera. Tannic acid could not be detected and very little phenolic substance was present. The quantities of anthocyanidin were fairly equal in each of the species. (The wood structure of *Platylophos* is not similar to that of the *Cunoniaceae*, and it is, as already stated, doubtful whether this genus should really be included in the *Cunoniaceae*; it seems more advisable to refer it to the *Saxifragaceae*.) The similarities, shown between the *Eucryphiaceae* and the *Cunoniaceae* here, may be regarded as another confirmation of the relationship which exists between these families.

VIII. Commercial value of the wood, bark, etc.

In general the Eucryphias have a heavy, strong and durable wood, and although it is not very common on the markets, in Chile, Tasmania and New South Wales the timbers are offered for sale under different local names. Also the bark of the Eucryphias,

* The quantities of tannic extracts are quoted from Record and Mell, Audas, and Maiden l.c.

which contains tannin substances, has a moderate commercial value.

E. cordifolia Cav., Chile. The wood is hard and strong, very closely grained, and weighs 39 lbs. per cub. ft. As the wood is easy to work, it is used in furniture, vehicle parts, yokes, oars and piling. It makes an excellent flooring and is principally in use in Southern Chile. As it is abundant south of the present main lumbering region, it is not common on the markets, but according to Prof. S. Record, it is in demand because it is not given to checking and so is preferred to *Fagus obliqua* Mirb. for railway sleepers and telegraph poles. The Indians use large trees for dugout canoes. The bark contains 15 per cent. of tannic extracts and is used for the manufacture of extract for commercial tanning. The flowers are rich in nectar and are an excellent source of honey. Prof. Record in " Timbers of Tropical America " mentions that *E. patagonica* Speg. is called ' huinque ' or ' huinke ' at Neuquen, Argentina ; it is a tree of 50 feet in height and 16 inches in diameter ; the wood moderately hard, finely textured and of an excellent quality for carpenter's use. It seems very doubtful to me whether the tree, described here, is really *E. patagonica*, and has not been confused with another tree, which is in use out there. Also a confusion with *E. cordifolia* Cav. seems not impossible.

E. lucida (Labill.) Baill., Tasmania. The wood of this species is moderately hard, strong and tough, free from knots and weighs 49 lbs. per cub. ft. It is leathery to work (hence the name ' Leather-wood '), finely textured and suitable for cabinet work and heavy constructions. The flowers produce honey with a distinctive flavour. The resin, exuded by the digitate glands on the bracts and the stipules, has antiseptic and styptic properties and therefore is greatly valued for cuts and bruises.

E. Moorei F.v.M., New South Wales and Victoria. This wood also is moderately hard, tough and beautifully clear, but is little used. It is free from knots and easy to work. The bark has been tried for tan by settlers with excellent results ; it yielded 21·4 per cent. of tannic extract with 7·74 per cent. of tannic acid.

IX. Miscellaneous Notes.

The seed anatomy of *E. cordifolia* Cav. is not very interesting from the taxonomic standpoint. The endosperm surrounds the moderately large embryo in about 5 or 6 cell layers, nearly everywhere of the same thickness. The endosperm is white and fleshy, and consists of small irregular cells with unthickened walls. The cell-contents consists of a number of large, round aleurone grains (protein grains), which are surrounded by a fatty oil substance. Starch is absent. The embryo, which is about equal in volume to the endosperm, possesses thick, fleshy cotyledons, in which many small aleurone grains and a quantity of oil serve as food reserves. Seeds of *E. lucida* (Labill.) Baill. were similar in composition. Pritzel (System. Wert der

Samenanatomie usw.; in Engler's Bot. Jahrb. **24,** 1898) found that on this seed anatomy the *Eucryphiaceae* might fit very well in the first natural group of the class *Parietales* in Engler's system, which included the families: *Dilleniaceae, Ochnaceae, Caryocaraceae, Marcgraviaceae, Quiinaceae, Theaceae, Guttiferae* and *Dipterocarpaceae.* In his opinion the differentiation of the embryo in the *Eucryphiaceae* is similar to that in the most highly developed *Dilleniaceae.* He excluded *Eucryphia* from the *Rosaceae* because of the presence of an endosperm. Although Pritzel's opinion possibly is correct, it seems better to maintain the *Eucryphiaceae* in the proposed systematic place near the *Cunoniaceae.*

Regarding the geographical distribution, it is remarkable to note that the genus *Eucryphia* is confined to middle and south western Chile and the extreme south-eastern part of Australia, including Tasmania. This might be regarded as evidence of a vegetation, which was present when there was either a direct or an interrupted land communication between Australia and South America in the temperate regions. From this point of view, therefore, it is a pity that neither from New Zealand nor from one of the Polynesian Isles in the Pacific Ocean are any more species in this genus or of a related genus known.

X. Summary.

The taxonomy of the *Eucryphiaceae* is fully discussed from as many aspects as possible. The following are the most important points that emerge :—

(1) The floral characters of the different species are very uniform. The most important diagnostic feature of the flowers are the hairiness of the ovary, the length of the peduncle and the number of bracts.

(2) Both simple and compound leaves occur.

(3) Hybrids are recorded, either in nature or in cultivation, for all species except *E. Moorei.*

(4) The distribution of the species is interesting. Two species occur in Chile, confined to the subtropical and temperate rain forest. *E. glutinosa* (compound leaves) is a lowland tree or shrub, while *E. cordifolia* (simple leaves) extends up the mountains to the level of the glaciers.

The other species are Australian, the compound-leaved species occurring in the subtropical rain forests of the continent, and the two simple-leaved species and their hybrid in Tasmania.

(5) The family is considered to be taxonomically most nearly related to the *Cunoniaceae.* This conclusion is based on morphological characters and on similarity of anatomical structure, especially on the occurrence of both simple and scalariform perforations in the vessels in the two families. Similarity in chemical properties also points to the same relationship.

LIV—MISCELLANEOUS NOTES.

Retirement of Economic Botanist.—Mr. H. C. Sampson, C.I.E., B.Sc., retired under the age limit from the post of Economic Botanist on September 30th, 1938. Mr. Sampson came to Kew in 1927 as the first occupant of the post, which was created in connexion with the grant from the Empire Marketing Board for the promotion of the economic development of the Empire, and his wide experience of tropical agriculture gained in India and Africa has enabled him to carry out very valuable work on crop improvement and on the introduction of new plants of economic importance into various Empire countries. Especial mention should be made of Mr. Sampson's visits to British Honduras, British Guiana, the West Indies, Florida, and to East and West Africa to study their economic resources, and of his recent "List of the Cultivated Crop Plants of the British Empire," which was published as Additional Series XII of the Kew Bulletin (1936).

Mr. Sampson was selected to accompany, as Adviser in Agriculture and allied matters, the Leverhulme Trust Fund West Africa Commission, which left England in October, 1938, to study West African conditions and problems.

The Minister of Agriculture and Fisheries has appointed Sir Geoffrey Evans, C.I.E., who is retiring from the post of Principal of the Imperial College of Tropical Agriculture, Trinidad, to succeed Mr. Sampson as Economic Botanist.

John Frederick Bailey.—It is with deep regret that we record the death of Mr. J. F. Bailey, at Brisbane, Queensland. He belonged to a family well-known in Australia for its services to botanical science, agriculture and horticulture. For many years he was assistant to his father, the late F. Manson Bailey, C.M.G., Colonial Botanist at Brisbane. During this period he visited various parts of Queensland and made collections of plants, some of which formed the basis of special reports. In 1905, he was appointed Director of the Botanic Gardens, Brisbane, a position he occupied until 1917. For a short time after his father's death in 1915, he was also Government Botanist and during this period published several papers on the Queensland Flora in collaboration with his nephew, Mr. C. T. White. From 1917 until his retirement in 1932, Mr. Bailey was Director of the Botanic Garden, Adelaide, South Australia. He was a fellow of the Royal Societies of Queensland and South Australia. For many years he was closely connected with the former society, being honorary secretary from 1894–1905, a vice-president in 1908 and president in 1909. He was the author of numerous articles on exotic and native plants and his advice on horticultural problems was constantly sought by public bodies and private individuals.

A Horticultural Autobiography.*—This account of the gardening experiences of a well-known amateur should have a wide popular appeal. The author writes in his usual humorous style. The book is profusely illustrated with black-and-white drawings, which vary considerably in merit: the frontispiece is distinctly gloomy. The text, divided into four sections of three chapters each, tells first of the author's early days of gardening ("Apprenticeship"), after which the scene moves to Loughton, where the reader is taken on a personally conducted tour of the garden at "The Summit," and is introduced to the innumerable treasures which it contains. Dr. Stoker takes an evident delight in finding out the individual preferences of each pet, and also in exploding the reputations of many for being "difficult." The book is a mine of information for any gardener who has to contend with conditions at all comparable to those in Loughton.

A Textbook of General Botany.†—The third edition of this general textbook was published in 1934. That a new edition has appeared after four years suggests that it has found considerable favour with students and teachers. Opinions must differ widely as to the contents and form of the ideal textbook, but the present work covers the ground of plant physiology, anatomy, and gross morphology fairly fully. There are also useful chapters serving as introduction to the study of ecology and genetics. Unfortunately there is little stress laid on the need for the students to see, handle, examine, draw, describe, and work out material and problems for themselves. To the teacher forced to cram students for examinations such a textbook may well be a godsend, but it gives little guide to any teacher or student who wishes to carry out "practical" studies in the field, experimental ground, or laboratory.

In this new edition, prepared by Prof. Robbins after the death of Dr. Holman, many changes have been made and certain sections have been re-written. This is particularly evident in the chapters dealing with plant physiology, which is probably the most difficult part of botany to teach adequately to students early in their course. So many of the basic principles, or what till recently were regarded as such, are now being called in question that the teacher has either to risk confusing the student by reference to opposing hypotheses, and sometimes apparently contradictory experimental results, or he has dogmatically to teach one viewpoint, which may or may not be correct, to the exclusion of others which, on our present knowledge, are equally possible. In this textbook the happy combination of

* "A Gardener's Progress," by Fred Stoker, M.B., F.R.C.S. (Edin.), F.L.S., V.M.H. Illustrated with Drawings of Plants in the Author's Garden by H. A. Thomerson. Putnam & Co., Ltd., 42, Great Russell Street, London, 1938. Pp. xii+457; xxv plates; 43 text-figures; sketch-plan. Price 15*s*.

† By R. M. Holman and W. W. Robbins, New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 4th edition, 1938. Pp. xvii+664. Price 20*s*. net.

gross morphology, anatomy, and physiology has much to recommend it, since it avoids the extremely artificial division of subject matter under such headings as morphology, anatomy, etc., found in many other textbooks. A brief discussion of hormones in their relation to growth phenomena is included. The importance of the study of pollen is also indicated.

The treatment of the cryptogams, in part 2, seems reasonably complete for a book of this scope, but it is out of proportion to the space devoted to the classification of the spermatophytes, and especially to the angiosperms. While the importance, from many standpoints, of the numerous and very diverse groups of " lower plants " should not be underrated, there remains the fact that the seed-bearing plants dominate the flora and vegetation of the world at the present day. They are also of supreme economic importance to man. It is therefore to be regretted that in a general textbook adequate space has not been devoted to an outline of their systematics. Even the attempt to summarize the " principal tendencies in the evolution of the flower " must appear to the critical student as either dogmatic statement or argument in a circle.

The illustrations are, on the whole, excellent and relevant to the text. The line drawings are usually very clear, the microphotographs exceptionally good, and the photographs well chosen. A glossary, an index of thirty pages, and a list of books for reference and collateral reading are included.

It may be suggested that a more detailed account of cymose and mixed inflorescences (p. 257) is desirable. The diagram to illustrate " inheritance in a monohybrid cross " might be improved by differentiating homozygotes from heterozygotes. What may prove a seriously misleading mistake is the printing on the back of the binding of the words " Third edition " when the title-page and the prefaces show that this is the fourth edition. W. B. TURRILL.

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